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REPORT

OF THE

COMMISSIONERS

APPOINTED

TO INQUIRE INTO THE SEVERAL MATTERS

RELATING TO

COAL

IN THE UNITED KINGDOM.

Vol. III.

REPORT OF COMMITTEE E.

STATISTICS OF PRODUCTION, CONSUMPTION, AND EXPORT OF COAL.

Presented to both Houses of Parliament by Command of Her Majesty.

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REPORT OF COMMITTEE E.

PREFATORY NOTICE.

TO HIS GRACE THE DUKE OF ARGYLL, Chairman of the Royal Coal Commission.

My Lord Duke,

On the 7th of July 1866 we were appointed to be a committee of the Royal Commission, "*To "inquire as to the quantity of coal at present consumed in the various branches of manufacture, for "steam navigation, and for domestic purposes, as well as the quantity exported, and how far and to what "extent such consumption and export may be expected to increase.*"

The questions included in this paragraph naturally embrace several others, especially the relation of the coal consumed to the quantity of coal raised,—the degree of economy practised under all the conditions of its combustion,—and the influences shown by the development or the opening out of coalfields in all parts of the world upon the exportation of our fossil fuel.

We felt that we had to determine, with all possible accuracy, the quantity of coal raised annually from our coal mines, and to ascertain the rate at which the progress of the development of our collieries had been going on, and to consider what increase in the consumption of coal, if any, might be expected to arise in future years.

It did not appear to us to be sufficient to show merely the rapid increase which has taken place in the production of our coal during the latest ten years, upon which some conclusions have been founded,—when it was determined by the Mining Record Office that the quantity raised in 1859 was 71,859,456 tons, and that it had increased in 1869 to 107,427,557 tons, or more than thirty-five million tons. It was evidently necessary to furnish evidence for a much longer period of the progress of the British coal trade, upon which might be founded conclusions of a more definite and comprehensive character.

One of the leading questions before the Commission is, *the* DURATION *of the coal remaining unworked in the coalfields of the United Kingdom.* This will receive, we are convinced, a fairly satisfactory answer,—the quantity of unworked coal in our collieries having been determined, and the extension of our coalbeds beyond the ascertained areas having been cautiously examined by the other committees of this Commission,—when this committee furnishes the evidence necessary to determine—with accuracy—the present average annual supply.

From the beginning of the present century, we have returns relating to our coal trade which are sufficiently exact to enable us to draw our conclusions with tolerable certainty. Since 1854 the Mining Record Office has published more exact returns. The notices given of the production of coal before the nineteenth century are necessarily slight, but they serve to mark the gradual progress of a most important industry, and to show its connexion with the development of our manufactures, and with the improvement of our means of internal communication. The consideration of these matters bear very importantly upon the question—as to how far and to what extent the consumption of our coal may be expected to increase.

A similar question is proposed as to our export of coal,—how far *such export may be expected to increase.* A merely speculative reply to this inquiry could not be indulged in. Before, therefore, anything approaching to a satisfactory reply could be ventured on as some solution of this important problem, it became necessary to institute a searching examination into the value of the coalfields of other countries,—the quantities of coal which their collieries produced,—and the rate of increase or decrease observed in that production. Information on all these points having been obtained,—the past progress and the present state of foreign coalfields having been attentively studied, we venture to advance to a consideration of the *probable* future. Some coalfields it may be expected will be for all practical purposes exhausted within comparatively a few years; while other known coalfields may be more extensively developed, and new coal deposits may be discovered. To give even the qualified reply which we have, with some hesitation, ventured to give, it became, therefore, necessary to examine, so far as it was practicable for us to do so, the known condition of all the coalfields of the world, and the results of that examination will be found embodied in this Report.

It has been affirmed by some who have thoughtfully examined the "coal question" that the progress of British industry, especially in some of its relations to manufacture and commerce, has been so

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remarkable, that "even a geometrical series does not adequately express its rapid expansion."* Arguments founded on this statement have been advanced to show that the increase of our coal consumption must keep pace with this vast extension of our industries. Such conclusions render it essentially necessary that the past and the present condition of all the large manufactures should be carefully examined, and the progress of our commerce should be cautiously studied. These points have engaged our especial attention, and the results are given in the following pages. From the data thus afforded, it becomes just possible to shadow out the probable future of a particular industry, and its relation to the question before us. It will be admitted that this investigation, which must not be neglected or slighted because it is a difficult one, is of the highest importance.

This committee will confine their enquiries within much narrower limits. The ample statements in the text of this Report, and the copious details of the Appendix, which have been collected with much labour, and examined with care, are referred to, as the evidences upon which we venture to arrive at the following conclusions in relation to the production of coal, its consumption and its exportation.

It may be convenient to state, in this place, the general results to which our enquiries have conducted us, referring to the following pages for the more explicit statements of details upon all the points which have been brought under examination.

As to the quantity of coal produced, and its home consumption.—The most reliable information obtainable appears to show, that in 1660 the coal produce of the United Kingdom was only about two millions and a quarter tons, and 40 years later it had increased by 364,000 tons only. Fifty years after this, or in 1750, there was an advance in the production of about two million tons, the total quantity raised in the kingdom being 4,773,828 tons. In 1800 the quantity of coal raised exceeded ten million tons. About this period the system of canal navigation was being rapidly extended, and the result was that coals were gradually finding their way into districts which could not be reached unless at great cost, by road; therefore the consumption of coal was rapidly increased. In 1816 nearly sixteen millions are given as the production of our collieries, according to one statement; and twenty seven millions, as given with considerable probability by another. The great uncertainty of the computations made, even so recently as the period named, is shown by the fact that one of the best authorities in the coal trade estimated the coal produce of the kingdom in 1829 as, exclusive of foreign exportation, being 15,580,000 tons, our foreign and colonial exportation in that year being only 369,847 tons,—or a total of less than sixteen million tons. Advancing to a later period, we find various estimates given of the production of our collieries by recognised authorities, all which are given in this Report.

Page 41.

Page 46. Appendix, p. 80.

Such computations are evidently more or less uncertain, no attempt having been made at this time to collect the returns of the produce of each coal district with any degree of care.

Page 65.

From 1854 the returns, however, become more exact, and we find that in that year our collieries produced 64,661,401 tons, which quantity, with a few curious examples of a decrease in some years, was gradually advanced, until in 1869 it acquired the large proportions of 107,427,557 tons.

It will be found upon examination that this large increased consumption of coal has a very intimate connection with the extension of our railway system. It cannot for one moment be denied that the remarkable development of our manufacturing industries greatly assisted in swelling the production of coal. An examination, however, of the returns which we have been enabled to give of the railway traffic, as furnished by the respective companies, often at a very considerable sacrifice of valuable time, and purely with a desire to furnish such information as would prove of value to the Commission, will show that with the extension of any particular railway system will be the distribution of an increased quantity of coal. To give one example only here out of many which may be examined in the chapter which treats of the railway distribution of coal, we find the North-eastern Railway carrying from the coalfield of Durham and Northumberland in 1859 2,718,599 tons, which quantity is steadily increased year after year until in 1869 that railway distributes no less than 8,280,310 tons.

Page 70.

That division of the Report which is devoted to the quantities of coal consumed for the purposes of manufacture will, we think, serve to show with a considerable amount of exactness the present rate of the home consumption of coal. We shall only in this place direct attention to two or three facts.

In 1855 we raised nearly sixty-four and a half millions of tons of coal. Of this quantity we exported nearly five million tons, and we used for the manufacture of iron, pig and bar, nineteen and a half million tons of coal, leaving to be consumed for all other purposes 39,872,729 tons.

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* "The Coal Question: an Inquiry concerning the Progress of the Nation, and the probable exhaustion of our Coal Mines." W. Stanley Jevons, M.A.

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In 1860 the coal raised amounted to nearly eighty million tons, of which we exported about seven millions and a quarter tons, and of which we used for all purposes in our iron manufacture more than twenty-three millions, reserving for every other purpose 49,449,162 tons.

In 1865 the coal raised was increased to more than ninety-eight millions. Of that quantity we exported above nine millions, and our iron manufacture consumed twenty-eight millions and three-quarters tons, leaving to be consumed for all other purposes 60,197,058 tons.

In 1869, the last year for which we have been enabled to complete our returns, the coal raised amounted to the enormous quantity of one hundred and seven millions and a half nearly. Of this we exported just ten millions and a quarter tons, our iron manufacture consumed nearly thirty-two millions and a quarter tons, leaving to be consumed for all other purposes 64,858,793 tons.

It has been estimated that in iron manufacturing districts one ton of coal is consumed per annum by each head of the population.

The tables which we have given show for the years already quoted that the quantities of coal left, after deducting the coal exported and the coal used in iron manufacture, was as follows, for each head of the entire population of Great Britain :— Page 178.

	Tons.	cwts.	qrs.	lbs.
In 1855	1	16	2	10
„ 1860	2	8	0	12
„ 1865	2	9	0	8
„ 1869	2	11	2	17

If, therefore, from these quantities we deduct about three quarters of a ton per head per annum for our actual domestic consumption, we obtain a fair comparative estimate of the relative quantities of coal used per head of the population for producing steam power in all our manufactures, other than iron, for carrying out processes of manufacture, for use in steam vessels, in locomotive engines on our railways, for conversion into gas, and every other purpose connected with our industries.

The tables given in the Appendix place in the clearest possible light the entire exportation of our coal over many years, showing the quantities which have been sent from each coalfield, and all the ports in foreign countries and in our colonies which have received that coal.

In the last two years our exportation of coal has reached, in 1869 9,775,470 tons, in 1870 10,635,449 tons, and, from the period (185) when the duty on exported coal was entirely removed, there has been a steadily increasing (but not at a rapid rate) demand for English coal for foreign consumption.

The notices, which we have prepared with every desire to furnish the most recent and the most accurate information, respecting the coalfields of all foreign countries, appear to prove, not only a steadily increasing production of coal in Europe, in Asia, and especially in America and Australia, but a considerable extension of the areas which promise to produce true and valuable coal. This being the case, we believe there is evidence to show that the foreigner will in the future be less dependent than he has been hitherto on the British coalfields for his fuel.

We do not desire to repeat here, even briefly, the evidence which we have given in the body of our Report so fully. We shall therefore venture, without further preface or explanation, to lay before the Royal Commission our answers to the questions with which we have been charged. Those replies are the result of the most pains-taking attention, and they are founded upon the most unbiassed and conscientious consideration of the subject in all its bearings.

Our impression, after a careful consideration of the whole question, is that our consumption of coal will be subject to oscillations of an irregular character from the quantity at present used—to an unknown quantity,—which will be constantly kept in check by the efforts made to economize fuel.

"*The quantity of coal at present consumed in the various branches of manufacture*" has been already briefly stated, and ample returns are given in the body of this Report, as well as of that used "*for steam navigation and for domestic purposes.*" With the increase of our population there must be an increase in the domestic consumption of coal, the rate of which can be determined within very small limits of error. With the extension of our manufactures using large quantities of coal there would be a largely increasing consumption of coal in the future, provided all conditions remained the same. The evidence collected by Committee B, supplemented by that included in this Report, convinces us that the desire to economize coal in every way, which is proved to be in operation, will balance to a great extent the consumption which would be due to the extension of our manufactures, and that therefore the quantity of coal used at present will be more effectively employed and will do more work in the future. The same answer serves in relation to the coal used for steam navigation, and to that employed for locomotive steam engines on our railways. See Report of Committee B. "Waste in Combustion."

If our "*export may be expected to increase?*"—can be answered only by referring to information collected as to the condition of other coal-producing countries. There appears to be a probability

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that, with the development of the enormous coalfields of America, and those of the East, especially those of China and Japan, and with the more effective extension of the known coalfields of Europe, there will not be any very considerable increase in the quantity of coal which may be expected to be exported in future years.

With these notices, which may be regarded as a brief summary of the conclusions to which we have been led by the inquiry, which is set forth in such detail in the following Report that every one will be in a position to form his own opinion, we conclude, with the hope that it may be considered by Your Grace and the members of the Royal Commission that the investigation made by Committee E has been satisfactorily prosecuted to the end.

The following is a general statement of the result of our inquiries, full details being given in the body of the Report:—

	Tons.
Total quantity of coal raised in 1869 - - -	107,427,557
„ of coal exported in 1869 - - -	9,775,470
Leaving for home consumption - -	97,652,087
	Tons.
Coal used in iron manufacture - - - -	32,446,606
„ general manufacture, for steam power, and other purposes - - - -	25,327,213
„ metallurgies, other than iron - - -	859,231
„ mines and collieries - - - -	7,225,423
„ gas and water works - - -	7,811,980
„ steam ships - - - - -	3,277,562
„ on railways - - - - -	2,027,500
Domestic consumption - - - - -	18,481,527
Miscellaneous - - - - - -	195,045
	97,652,087

(Signed) RODERICK I. MURCHISON.*
ROBERT HUNT.

* Although my name stands at the head of this Report, it is my bounden duty to state that all the essential parts of it have been prepared by my colleague MR. ROBERT HUNT, whose valuable works on the Mineral Statistics of the United Kingdom as produced in the MINING RECORD OFFICE, followed up, as they have been, by his sedulous researches in many quarters during the inquiries of this Commission, have produced the result now laid before the public.

(Signed) R. I. M.

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COAL COMMISSION.

REPORT OF COMMITTEE E.

Consisting of Sir Roderick I. Murchison, Bart., K.C.B., F.R.S., &c., and Robert Hunt, F.R.S., who were appointed on the 7th July 1866 to be a Committee

"To inquire as to the quantity of coal at present consumed in the various "branches of manufacture, for steam navigation, and for domestic purposes, as "well as the quantity exported, and how far, and to what extent, such con- "sumption and export may be expected to increase."

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CHAPTER I.—THE ORDER OF THE INQUIRY.

Although we dare not hope to answer the questions which arise out of each section of this inquiry with any equal degree of exactness,—and certainly we will not venture in any case to guess at a reply,—we feel that the numerous facts which have been, with considerable labour, gathered together, may be referred to as a basis, upon which, after a careful consideration of the whole subject, some conclusions, of a fairly satisfactory character, may be founded.

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Coal produced annually.

We have, in the first place, endeavoured to determine the number of statute tons of coal, of all kinds, raised from our coal beds annually, for as long a period as can be obtained from any records upon which any reliance can be placed. This has naturally led to a careful search of all the existing published evidence, and of all documents to which access could be obtained. The Mining Record Office fortunately possessed much valuable information respecting the coal trade of the Tyne, the Wear, and the Tees. In the museum of the Antiquarian Society of Newcastle-on-Tyne are many volumes, containing curious matter connected with that great coalfield. The libraries of the British Museum and of the House of Commons have been diligently examined, and several libraries existing in the centres of the coalfields have furnished much valuable matter. We therefore hope that this, the introductory division of our subject, will not be without interest, and that it will furnish a clear historical sketch of the progress of the British Coal Trade. The production of coal of late years has been determined by the means which have been organized by the Mining Record Office for the annual production of the "Mineral Statistics of the United Kingdom."

Beyond this, the question having been raised by the Royal Commission as to the rate at which our manufactures using coal have increased in former years, we have had to examine the conditions prevailing in the past, so far as any reliable history of the staple industries of the kingdom could be

Coal used.

obtained. This we have endeavoured to do, and, carrying back our inquiry for a certain number of years, we have attempted to show, with reasonable precision, the rate at which our consumption of coal has increased, and we believe we correct some errors which have for some time prevailed.

"The coal consumed in the various branches of manufacture" has been ascertained by issuing in the

Appendix, p. 1.

first place the circular E. 1. to every colliery in Great Britain, and, more recently, for the purpose of obtaining the production of coal to the end of 1870, the circular E. 2, requesting special information as to the quantities of coal sold for local consumption or "landsale," of that which has been sent out of each district by railway or canal, of all the coal which has been sent by sea to other ports of the United Kingdom, and of that sent to Foreign parts.

Ditto, p. 1.

Of these forms more than 9,000 have been circulated in the years 1866, 1869, 1870, and more than two thirds of the circulars have been returned; the answers to the questions being quite as full as could be reasonably expected.

Appendix, p. 1.

The circular E. 3. was also sent to all the manufacturers using coal, in any quantity, throughout the United Kingdom. Of this circular about 30,000 have been issued, and the returns have been generally satisfactory. The names and addresses of those manufacturers, except such as are engaged in metallurgical industries, were ascertained by consulting every directory and trade list which could be obtained through Her Majesty's Stationery Office. Local trade associations were consulted, and in many instances city and borough officers have rendered the most valuable aid.

The largest number of those circulars have been sent through the Post Office, but in the city of Glasgow, and in a few of our large towns, they have been distributed, and the answers collected, by the police, while in some other places the Chambers of Commerce have undertaken the labour of collecting the required information for the Royal Commission.

Iron making.

As by far the largest quantity of coal is used in this country in the manufacture of pig iron, and its subsequent conversion into merchant iron, it was of the first importance to determine as correctly as possible the quantity of coal and coke employed in the various metallurgical processes connected with the blast furnaces, the puddling furnaces, refineries, steel manufacture, and the like. The business of the Coal Commission in this especial direction had been anticipated by the Mining Record Office of the Museum of Practical Geology, and the results given in the "Mineral Statistics of the United Kingdom" have been, with necessary corrections, adopted.

Appendix, p. 1.

The circular letter (M. R. O.) was used to obtain the returns, and this was, in very many cases, supplemented by letters written to the iron masters calling their attention to the national importance of the inquiry, and soliciting their aid. The results given may be received as perfectly reliable, returns having been made, often in confidence, giving the most precise account of the coal consumed in every stage of the iron manufacture.

Gasworks, Appendix, p. 2.

To the gasworks which have been stated, somewhat loosely, to consume nearly one tenth of the coal raised in the United Kingdom, a special circular E. 4. was sent, and from a large number of these establishments very ample returns have been received.

After all the attention which has been given to this branch of the inquiry, a considerable number of works remained to be estimated. The exact number of works returned and of coal used at them is

Appendix, p. 2.

given in the table in the Appendix. To meet the difficulty of insufficient returns, inquiries have been pushed, either by personal applications or by letters addressed to gas managers and engineers, and these applications have been followed by satisfactory results.

Mines. Appendix, p. 2.

It was essential that the coal used in the production of the steam power employed in pumping water from our mines, and in bringing the valuable minerals from the subterranean depths to the surface, should be ascertained. This has been effectually determined by the returns obtained from circular E. 1, and those procured by the solicitations of circular E. 5.

Waterworks. Appendix, p. 2.

The coal employed in pumping by the Water Supply Companies has been obtained by direct application to the engineers, or to the corporations having the waterworks under their managements, and by circular E. 6.

Several important industries have, necessarily, been made the subjects of special personal inquiries. Amongst others may be named the Cotton, Woollen, and Linen manufactures, our Metallurgical processes, Brick and Tile manufactures, Pottery, Glass making, Chemical Works, Brewing and Malting. Beyond this, the question of the coal used in warming buildings, and the actual quantities of coal used in our domestic fires, have been made the subjects of especial investigation. In addition to the quantities of coal brought into towns by railways and canals, we have taken considerable pains to learn the quantities delivered by carts taking the coal directly from the pit's mouth, or as it termed by "landsale" delivery.

Railways.

The railways have, upon either written or personal application, furnished this Committee with the quantity of coal used in their locomotive engines and for all other purposes upon each line respectively.

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Beyond this, all the great coal-carrying railways have, in the most liberal manner, often at a great cost of time, and always with considerable interruption to the routine duties of their offices, furnished in the most complete detail the distribution of the coal passing over their systems. Similar returns have been obtained from the more important canals, whether they have been in possession of the railway companies or of private corporations. DISTRIBUTION by railway and canals.

Thus the production of coal for several years has been ascertained within very small limits of error. The distribution of that coal has been fully and faithfully given in this Report. The quantity of coal used in special manufactures beyond those which have made returns is estimated, the estimate being based on information collected with much labour, and which has been furnished with such an amount of detail and precision as should secure confidence in its correctness. We have been enabled to separate the coal used in actual manufacture from that which is used as a source of heat for the production of steam, thus to show the value of the energy which has been pent up in our coal beds, but which we reclaim annually, and convert into power, by the agency of which we supply the world with necessaries and luxuries.

The quantity of coal consumed "for steam navigation" has been sought for by means of the circular E 7, of which copies were issued to every registered steam ship proprietor in the kingdom. The circulars issued were prepared to collect the returns from two thousand six hundred and twenty-eight steam vessels. The returns made have been very complete, representing one thousand five hundred and fifty-eight steam ships. With the utmost liberality, "Lloyds'" has given its aid to the Royal Commission, by issuing special circulars of inquiry to such steam shipowners as had not made returns to this Committee. With this assistance the quantity of coal used by the merchant steam navy has been correctly estimated. The Admiralty has furnished the quantity of coal used for steam navigation in the British navy, and from the War Office a return of all the coal employed in that department of the public service has been made. STEAM NAVIGATION. Appendix, p. 2. Merchant marine. British navy. The War Office.

In addition to the return made by the Department of Her Majesty's Customs to the House of Commons, relating to the export of coal, much additional information has been furnished for the especial use of the Committee. EXPORT OF COAL.

The conditions of the coal trade of other countries, bearing as it does on the question of our exports, have been determined by carefully consulting every published statement within our command. Beyond this, we have corresponded with many of the most reliable authorities in Europe and America, and much original information will be found in the chapter devoted to the considering of the coal fields of other lands. COAL OF FOREIGN COUNTRIES.

The prices of coal at the pit's mouth have been ascertained for every coalfield of the United Kingdom, and from the returns obtained a table has been constructed showing the actual prices of coal which have prevailed of late years, before any charges for carriage have been added. Beyond this, tables are given, from reliable authorities, showing the prices which prevailed in former years. This will prove important, as showing their relation to the present prices. Since the price of coal will necessarily regulate the consumption of it, these tables will, it is thought, have a present and future value. PRICES OF COAL. Appendix Table No. 152, p. 208.

CHAPTER II.—THE COAL PRODUCED BEFORE 1800.

It may appear to many, at the first thought, that the Coal Commission has no concern with the early coal trade of England. Upon reflection, however, we believe it will be seen that it is not possible to give any thing approaching to a satisfactory reply to the questions included in the Royal Commission without an examination of all that is preserved in relation to the production of our collieries.

With the period which may with propriety be comprehended within, what we may call, the traditionary ages of British mining, the Coal Commission has no concern. When indeed we attempt to ascertain any thing respecting the quantities of coal raised or used even 200 years since, the information obtained is usually of a very problematical character. There is but little reason for doubting that British coal has been known from a very early period, or that it was used, although in small quantities, in the days of the Roman occupation of those islands. Coal has been found amidst the remains of Roman civilization in the city of Uriconium and elsewhere. Roman acquaintance with coal in Britain.

The peculiar appearance of a coal seam, as seen at its outcrop, when laid bare by the action of torrents or by any other cause, would probably attract the attention of the inhabitants of our woods and wilds; a people who were certainly gifted with perceptive powers of no mean order, however uncultivated may have been their reflective faculties. Possibly a considerable time would pass away before the discovery would be made that these black stones would burn; but this fact once discovered, the use of coal in the vicinity of the outcrop of a seam would soon become general.

Passing over all the statements made respecting the use of coal before the twelfth century, which are indeed exceedingly fragmentary, we have gathered together a few notes which will, we believe, serve to show the progress of the coal trade in Great Britain from about that period. The twelfth century.

The information to be obtained respecting the coal trade from the rivers Tyne and Wear is tolerably ample; but there is very little to be gleaned from any existing records relative to the production at this period of coal in other parts of the kingdom. We have searched with some diligence the county histories and works of a purely local character, and our labours have been but ill rewarded. We believe, however, that the notes which we have gathered together will serve to convey some, although in many cases only a faint, idea of the steady progress of coal mining up to the commencement of the nineteenth century.

It must not be expected that anything like a complete history of coal mining is intended in the following pages. We must refer those who desire detailed information as to the working of coal mines in special districts to other sources. Our sole purpose is to furnish some starting point from which

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we may be in a position to commence our calculations as to the probable quantity of coal which has been removed from our coalfields, before the immense drain commenced which so peculiarly marks the present period.

A.D. 1180. DURHAM and NORTHUMBERLAND.—In 1180, Bishop Pudsey, of Durham, granted some land to a collier, to provide coals for a smith at Coundon, in the county of Durham; similar grants being made at Sedgefield and Bishop Wearmouth.*

Henry III., 1234. †King Henry the 3rd, 2nd day of July 1234. He confirmed a charter granted by John in 1213. By letters patent under the great seal, dated Westminster, December 1st, in the 23rd year of his reign, Henry 3rd gives the good men of Newcastle, "licence to dig *coals* and stones in the common soil of "that town without the walls thereof, in the place called Castle-field and the Frith; and from thence "to draw and convert them unto their own profit." Again, upon the petition of the "honest men of "Newcastle, that his Majesty would be pleased to give them all the stone and *coals* in a place called "the Frith adjoining to the former." On the 11th May, in the 30th year of his reign, his Majesty granted this. "*All which coals and stone have, do, and will amount to many thousands of pounds.*"

A.D. 1279. In 1279 coal was purchased at Dover for the use of the Castle.†

A.D. 1296. In 1298 coal is sold‖ at Southampton. It is quoted in the accounts of Clare Castle and Clarette, part of the possessions of the Earl of Gloucester.‡

In the taxing bill of Colchester, *Rot. Parl.* vol. 1, "sea coal dealers" are mentioned, at the close of the 13th century.‡

A.D. 1281. In 1281 Newcastle is said to have had a considerable trade in coal.

A.D. 1300. In 1300 coal was used in quantity by the brewers and smiths of London.§

A.D. 1306, In 1306 Parliament petitioned the King Edward I. to prohibit the burning of coal in London, on the ground of its being an intolerable nuisance. It was prohibited, and wood ordered to be used.‖

In 1321–2 coal was evidently used in the palace, as a claim was made for ten shillings on account of coal which had been ordered by the clerk of the palace.¶

Edward III., 1358. Edward the 3rd, in answer to a petition from the "burgesses" of Newcastle, granted, on the 10th day of May in the 31st year of his reign, "the said burgesses, and their heirs, in the said moor and "lands, may *dig, and may have coal, slait, and stones*, and other profits coming out of the said moor "and lands." The commentator, says "this is the first claim the said burgesses lay to the Castle "Moor, being a quantity of 850 acres of ground, beside pasture for all their kine, and *coals for all their* "*fuel*, which are gotten upon the said Castle Moor."**

Richard II., 1378. On the 9th day of April 1378, Richard the 2nd confirms all former charters and grants to the town of Newcastle. "The same privilege as granted before in *diging of coals*, slait, and stone, in Castle Field and Castle Moor."

A.D. 1379. In 1379 the first government tax was laid on coal.

Henry V., 1422. In 1421 or 1422 we find that Henry 5th, in the 9th year of his reign, enacted, that the king should have two pence for every chalder of coal "of unfranchised men, in the river and port at Newcastle-upon-Tyne, as customs, and, for the better "knowledge of such customs, ordains, that all keels or boats which carried coals to ships should be "of the just burden of twenty chaldron of coals, &c."

The burden of the keel fixed at 20 chaldrons.

Henry VIII. During the reign of Henry VIII. there was evidently a considerable trade in coal between the Tyne and France, although we have not discovered any reliable returns of the shipments preserved.

Edward VI. A.D. 1552. In a letter from Thomas Barnabe to Sir William Cecil, proposing methods of distressing the French, the following passages occur, which clearly indicate a considerable coal trade with France:—

"If it please the Gownsele to understande those things that I will show you, they shall sette vi. or vii. thowsand maryners a worke more than theris, in that thinge that France can lyve no more withowte, then the fyshe without water; that is to say, Newe-castele coles; which without that they can nother make stele worke, nor metall worke, nor wyer worke, nor goldsmythe worke, nor gonnes, nor no manner of thinge that passeth the fier. And as for them, ye shall se in peace time iij. or iiij. score of ships of Normans and Brytons at ones, as soone as theyr fishinge is done, and as theye be departed comethe as manye moe; so that I occupying saveconduytes in France, have bought coles at Newcastele for ij^{s} & ij^{d} a chauldron, & for xiij^{teen} nobles have sold them agayne in France."

"Also the vice-amerale of Normandye, Mons^{r} De May, and the Viscounte of Dieppe, have prayed

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* *Industrial Resources of the districts of the three Northern Rivers, the Tyne, Wear, and Tees.* Coal-mining, Hull, The Coalfields of Great Britain.—2nd edition, p. 19.

† Many of the notices of the coal trade of Newcastle have been gathered from a book of which the following is the full title:—ENGLAND'S GRIEVANCE discovered in relation to the coal trade, with the map of the River Tine, and situation of the town and corporation of Newcastle; the tyranical oppression of those magistrates; their charters and grants; the several tryals, depositions and judgments obtained against them; with a breviote of several statutes proving repugnant to their actions, with proposals for reducing the excessive rates of coals for the future; and the rise of their grants appearing in this book. By Ralph Gardiner, of Chirton in the county of Northumberland, gentleman. London, printed for R. Ibbitson, in Smithfield, and P. Stent, at the White Horse, in Giltspur Street, without Newgate, 1655. Reprinted at Newcastle by F. Akenhead and Sons, fronting the Exchange, 1796. When the information has been derived from other sources the authority will be given.

‡ Roger's "*Agriculture and Prices in England.*"

§ *The Liber Albus*, the White Book of the City of London, compiled A.D. 1409, by John Carpenter, common clerk, and Richard Whitington, mayor, gives but little information; showing indeed that the trade in coal was very unimportant up to this date. We find that coal "for two quarters of sea coal measured by the King's quarter, one farthing," was "the customs of Billyngesgate" in the reign of Henry the 3rd; and that judgment of pillory for false sacks of coals was passed between 1376, Edw. III., and 1399, Rich. II. There is also a record, "Ordinance as to coals," preserved in the Guildhall of a date sometime between 1353, Edw. III., and 1575, Edw. III.

‖ *Stowe's Annals, by Homes.* London 1652, p. 1502. Stowe tells us "that whereas in the year of our Lord God 1306 King "Edward 1st by proclamation prohibited the burning of sea coal in London and the suburbs, to avoid the sulferous smoke and "savor of the firing * * * * "there is so great scarcity of wood throughout the whole kingdom, that not "only the City of London, all haven towns, and in very many ports within the land, the inhabitants in general are constrained to "make their fiers of sea cole, or pit cole, even in the chambers of honorable personages * * * within thirty years "last, the nice dames of London would not come into any house or room where sea coals were burned, nor willingly eat of "the meat that was either sod or roasted with sea coal fire."

¶ Hull. *Coalfields of Great Britain.*

** Ralph Gardiner, "England's Grievance discovered," 1655.

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me to bring in Newcastle Coles, and I should have any other manner of comodyte that they hadde within the Realme, whether yt were poldaries for saylis, or any other thinge."*

In Sussex and Southamptonshire, about 1577, the smiths and workers in iron were driven to the use of wood, the cost of coal being so great, and the supply so small. A.D. 1577.

Queen Elizabeth obtained a lease from the late Bishop of Durham, dated the 26th of April, in the 24th year of her reign, of all the whole manors of Gates-head and Wickham, and all the coal pits and coal mines within the said manors * * * at the rent of ninety pounds per annum, or thereabout, for ninety-nine years. Elizabeth, 1582.

The Earl of Leicester is said to have procured this from the queen, and to have sold or given the same to "Sutton of Charterhouse," who for 12,000*l.*, as is reported, sold the same to the mayor and burgesses of Newcastle. The yearly value is subsequently stated to be "worth at least 50,000*l.* per annum, attested by Doctor Cradock, sometimes Archdeacon of Northumberland."

Queen Elizabeth required the arrear of 2*d.* per chaldron, which was granted to Henry 5th, in the 9th year of his reign, which was neglected to be paid.† The mayor and burgesses "beseeched those "arrears may be forgiven by reason of their inability; and to grant them a new charter, to incorporate "a new fraternity or brotherhood to be called free host men,‡ for the selling and vending of all coals "to shipping, and in consideration thereof they would pay to her majesty and her successors *twelve* "*pence for every chalder*, exported from thenceforth to the free people of this nation." The queen grants this petition, upon condition "that they should sell all coals to masters of ships." Henry V., 1422.

This is an example of the prevailing spirit of that intellectual and enterprising age. The energy which Queen Elizabeth displayed herself was communicated to all around her. This led to a great increase of trade (see *Mac Pherson's Annals* on this point), and to a wide spread and until then unknown degree of luxury amongst the people. Camden, in his history of Elizabeth, under the year 1574, gives striking examples of this. Commerce flourished, manufactures were established, mining was encouraged, the Queen herself introducing German miners to instruct the miners of England, and every industry was improved.§ Elizabeth, 1600.

We learn from some documents preserved in the Mining Record Office that in 1602 there were in Newcastle 28 acting fitters, who had 85 keels, and who vended coal at from 8*s.* to 10*s.* per chaldron. In 1616, 13,675 *tons* of coal, says the author of *The History of Fossil Fuel*, were shipped from Newcastle, probably *chaldrons* were intended; but in 1699 there were shipped from the North to London alone 200,000 chaldrons. Charles I. 1602. 1610. 1616. 1699.

Ralph Gardiner, commenting upon this, states that in 1655, "at this day the fitters reckon with the "masters for so much a chalder, as *eleven shillings*, for so many as is conceived to be aboard the ship, "and then he goeth with the masters to reckon, which the said master payes the 1*s.* per chalder "custome, being allowed in his hand, the master conceives he doth not pay it further then being left "in his hand by the fitter, but if the masters will look upon that lease, they will find they are to have "the best coals for 10*s.*, and the worst for 9*s.* the chalder at most, and now they pay 11*s.*, by which "means the one shilling per chalder is paid by the master, and not by the host-man, and so falls upon "the whole nation's back. I refer you further to the lease, for if the master buy dear, he must needs "sell dear." 1655. Coals 11*s.* the chaldron. About 1580–90 coal, best 10*s.* and worst 9*s.* the chaldron.

James granted the corporation the conservancy of the river Tyne, naming the mayor and 16 others as commissioners, on the 29th January 1613. In nine articles the laws regulating the navigation and conservation of the Tyne are set forth. These are to prevent the wilful throwing or accidental falling of coal or ballast into the river. Two of the articles are as follows: James. 29 January 1613.

(4.) "That all salt-pan owners shall carry away their pan rubbish from off their keys or wharfs every forty days, that none fall into the river."‖ Saltworks on the Tyne.

(7.) "That no coals or stones be digged within sixty yards, on a straight line from a fall sea-mark, in any part of the river, to the end that none fall in."

There is a salt spring at Birtley in Durham "which has for nine years produced, and may for "eternity produce, 20,000 gallons per day. Several great works for making salt from sea water have "long been established at South Shields, but it is supposed their consumption has been much reduced "by that at Birtley."¶

King Charles, in August in the 13th year of his reign, "created a new corporation of *free-host-men* "in Newcastle (called in England '*coale engrossers*'), and grants a lease to Sir Thomas Tempest, "knight, and others, for the selling of all coals exported out of the river of Tyne, and to receive "eleven shillings and fourpence per chaldron, custome, and twelve shillings from all strangers, which "shall be transported over sea, and to have twopence per chaldron towards their charge." In 1635 the price of coals in London was 10*s.* the *London* chaldron. CHARLES I. Coals sent coastwise 11*s.* 4*d.* a chaldron. Coal sent foreign 12*s.* a chaldron.

This corporation had power to levy fines, and to seize coals if not of due measure, of "one and twenty bouls to the chaldron." Chaldron defined to be 21 bouls.

Charles in June following, in the 14th year of his reign, "incorporated another company of coal "buyers, namely, Mr. Thomas Horth, and other masters of ships, to buy all coals exported out of the "ports of Sunderland, the river of Tyne, Newcastle, Blith, and Barwick, paying to the King one

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* MS. Lansd. 2, Art. 85, Orig. Original Letters illustrative of English History, &c., with notes and illustrations, by Henry Ellis, F.R.S., Sec. S.A., Keeper of the manuscripts in the British Museum. 1827. Vol. 2, p. 195.

† *Campbell's Political Survey of Great Britain*, vol. 2, p. 81. *Edington on the Coal Trade*, p. 41. *History of Fossil Fuel*, p. 316. *Proceedings of the Archæological Institute of Newcastle.*

‡ *Host-men* or *hoast-men*. "And whereas the said town is an ancient town, and the mayor and burgesses of the same, time out "of mind of man, they have had a certain guild or fraternity, commonly called *hoast-men*, for the discharging and better disposing "of sea coals, and pit coals, grind stones, whet stones, and rub stones, in and upon the river and port of Tyne, which guild or "fraternity is granted or established by none of the said letters patent." The Queen incorporated this body, "and granteth that "William Jennison the elder, and 44 persons, more commonly called the *hoast-men* * * * * shall be one body "corporate and politick."

§ MacPherson's Annals. Camden's History of Elizabeth.

‖ These salt works generally appear to have been for the evaporation of sea-water only.

¶ General View of the Agriculture of Durham, 1794.

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Coal in London 17*s.* the chaldron in summer, 19*s.* the chaldron in winter.

"shilling per chaldron, custome, and to sell them again to the city of London (year 1638), not "exceeding seventeen shillings the chaldron in the summer, and nineteen shillings the chaldron all "the winter, provided they had a free market, and a just measure at Newcastle, &c., which they were "debarred of, by reason of the foregoing lease granted to Sir Thomas Tempest." In July following, Charles grants another patent to Mr. Sands, with others, for farming the customs, of one shilling upon every chaldron, at the yearly rent of 10,000*l.* This clearly shows that at this time the export from the northern coalfield was not less than 200,000 chaldrons. In 1642 we have an "ordinance" settling the prices of Newcastle coal in London at twenty shillings the chaldron.*

Export of 200,000 chaldrons.

January 9th, 1642, to November 14th, 1644.

Coal trade with Newcastle prohibited.—Charles 1st ordained that all trade to Newcastle-on-Tyne for coals, &c., be prohibited, &c., &c., by reason that town is conceived to be the principal inlet of all foreign aid and forces for strengthening themselves against the Parliament, &c., &c.

February and June 1642 and 1643.

Two ordinances were made for setting a rate upon coals at London, *being so scarce* and enhanced to such a great rate, that all the poor were *in a very sad condition.*

Coals, owing to this, 4*l.* the chaldron.

The prohibition of trade with Newcastle "caused coals to be four pound the chaldron, and salt four "pound the weigh."

1643.

A pamphlet published in 1643 well shows the kind of warfare which was being carried on between the charcoal merchant and sea-coal merchant at this time. Its title is as follows:

"SEA-COALE, CHAR-COALE, and SMALL-COALE, or A DISCOVRSE between a Newcastle collier, a small-coale-man, and a collier of Croydon, concerning the prohibition of the trade with *Newcastle;* and the fearful complaint of the Poore of the Citie of London, for inhancing the price of Sea-coales. London. Printed for Hugh Adamson, Jan. 27., Anno Dom. 1643."†

The spirit of this pamphlet may be judged of from the following brief extract:—

Sea Coale.—"Things must be as they may, Sir. I know you laugh in your sleeve at my misfortune, and hope to come in request by my banishment; but in faith you are deceived. I am not reduced to so low an ebbe, but I have stocke enough to keep me alive in the citie, till by a happy peace I can receive supplies from my own country. Marry, some body shall be sure to pay for it, for though

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* COPY OF AN ORDINANCE

OF THE

LORDS AND COMMONS

Assembled in Parliament.

That no wharfinger, woodmonger, or other seller of Newcastle coales, within the cities of London and Westminster, or the suburbs thereof, shall after the making hereof sell any Newcastle coales above the rate of 23*s.* the chaldron, and after the first of April next, above 20*s.* at the most.

And if any shall wilfully transgresse this Ordinance they shall be committed to prison, and there continue until they shall conforme themselves thereunto.

And the lord maior and sheriffs of the city of London and Middlesex are hereby required to see this put in execution.

Die Martis, 21 Feb. 1642.

Ordered by the Lords and Commons assembled in Parliament, that this Ordinance be forthwith printed and published.

JOHN BROWNE,
Cler. Parliament.

Feb. 23.: Printed for John Wright in the Old Bailey, 1642.

AN ORDINANCE

OF THE

LORDS AND COMMONS

Assembled in Parliament,

Die Martis, 21 Februarii 1642.

For as much as information hath bin given that the woodmongers, wharfingers, and other sellers of Newcastle coale in the cities of London and Westminster, and the suburbs of the same, taking advantage of the late Ordinance made by both Houses prohibiting ships to trade into Newcastle for coales, have raised the prizes thereof unto an unreasonable and excessive rate, in respect of the rate they have bought the same at, to the great oppression of the poorer and meaner sorts of people inhabiting the said citie and suburbs. Whereupon the House of Commons, by an order dated the twenty-eight of January, referred the consideration thereof unto the Lord Maior of the city of London, to informe himselfe what might bee a reasonable price, having equall respect both to the seller and the buyer, and to present his opinion to the Houses; and in the mean time ordered, that the price should not exceed twenty-two shillings the chaldron. Whereupon the Lord Maior, calling to his assistance the aldermen of the said citty, did certifie that twenty-two shillings the chaldron at the wharfe was a faire and fitting rate. But for the encouragement of those that trade in coale to bring in their ships of lading into the River of Thames, and supply the market there, certified that twelve pence more upon the chaldron during this winter might be allowed.

The Lords and Commons taking the same into their consideration, doe hereby ordaine and order, that no wharfinger, woodmonger, or other seller of Newcastle coale, within the cities of London and Westminster, or the suburbs or liberties thereof, or within the borough of Southwarke, shall at any time after the making of this Order and before the first of April next ensuing, sell any Newcastle coale above the rate of twenty-three shillings the chaldron at the wharfe; and from and after the said first of April, above the rate of twentie shillings the chaldron at the most. And the Lord Maior and sheriffs of the city of London and Middlesex, the justices of peace of the countie of Surrey, respectively in their several jurisdictions or any two of them, are hereby authorized and required to take care for the one execution of this Ordinance, and in case any shall wilfully transgresse the same, to commit him or them so transgressing to prison, until he shall conforme himselfe thereunto, provided that any person that shall find himselfe grieved by reason of such commitment, may appeale to the Committee of Lords and Commons for advance of monies, who hereby are authorized to heare his complaint, and to discharge him of his imprisonment, if they shall find cause.

And it is hereby further ordained and ordered, that no Newcastle coale, pit-coale, or sea-coal shall be transported out of this kingdome into any ports beyond the seas, without the speciall order of both Houses of Parliament, and the Earle of Warwicke, Admirall of the Fleet, and all the captaines and officers thereof, and the officers of the Custome House, and of all the ports of the kingdome, are to have speciall care to see the same duely observed.

And it is ordered that this Ordinance bee forthwith printed, and the Lord Maior and sheriffs of the city of London and Middlesex, are to take care that the same bee published in the cities of London, Westminster, Southwarke, and the suburbes of liberties thereof, and the collectors of the customes are forthwith to send it to the severall ports of this kingdom.

FINIS.

A copy of this document is preserved in the Mining Record Office.—*Bell's Volumes*, vol. 1.

† Reprinted at Newcastle in 1843. "This reprint is from a copy in the library of Sir G. Sharp."

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I send fewer of my coales then formerly, yet shall they be double the usual rate, and countervaile my losse that way within the Monthe; (would it be some sound frost) I would be at three pounds a chaldron at least. Some of my customers that deal with me by retaile, sell me twopence in a bushell dearer already, and at the wharf, my prime chapmen, the wood-mongers, begin to put a large value upon mee, so that an ill wind it is which drives no bodie to profit. I shall be a gainer rather than a loser, be enriched, and no way impoverished by this prohibition of traffique with Newcastle."*

High price of coals, 1643.

Small Coale remarks: "That if some course be not taken, the people, especially the poorer sort, must undergo great want."

Charcoal.—"What need they do so, when they have me and my cousin *Billet* and brother *Faggot* in such plenty? Were *Sea-coles* whole lineage burnt out, I and my kindred could supply the defect of the city far more cleanly and sweetly than this *vaporous sooty-faced* sea-coale can doe possibly.

Sea-Coale.—"It is impossible but thy malice must break out against me, thou spark of iniquity, thou suffocating bastard, begot between a *Sussex Ironmonger* and a *Kentish Longtail.* Thou serve the city as well as sea-coale? Thou art burned out like a farthing candle, immediately. One bushell of mee being worth a loade of thee, or an hundred of your cousin *Billets* and *Faggots* that you so boast of. What are they but mere flashes, quickly in and quickly out, whilest I, by burning, cake, and grow more useful in my very cinders, then either thou art at thy perfect estate, or *Billet* and *Faggot* can be," with much more calling of hard names.

Ralph Gardner petitions, in September 1653, the Parliament to make North Shields a market town, and a place for the shipment of coal. Amongst other matters of complaint, and which he prays to have remedied in his petition, are— 1653, Sept. 29.

"That the coal owners of Northumberland and county of Durham may have free liberty to sell their own coals to ships, and not to be enslaved by the free-hoast men of the town of Newcastle.

"That no more ships may be compelled up the dangerous river seven miles, whereas they need to go but one mile, never any coals being to be had at Newcastle, which would save many ships from sinking, and cause them to make upwards of three voyages in the year more than they do, which would cause two or three hundred thousand chaldrons of coal more to be sold, and the excessive prices to fall under twenty shillings the chalder all the year."

Coal 20*s.* the chaldron.

Numerous charges are brought by Gardiner and his witnesses against the free-men of Newcastle. A few of these, as giving information, concern this inquiry:—

"Mr. Thomas Partridge, of Gateshead master, being loaded at Newcastle by Thomas Read, fitter, with bad and unmerchantable coal, which he had sold for good coals to Mr. Clark of London, and M. Otridge, M. Godfrey, M. Harrison, and others, at *the rate of* 31*l. the score;* but proving so bad he was threatened to be sued, &c."

Coals at 31*l.* the score.

"These are to certifie that David Lindiman, master of a ship called the 'Fortune' of Statin, did "load his ship with coals in the said port of Newcastle-on-Tyne, and cleared in the custom house "for three score and twelve chalder of coals." Keelmen and others were sworn, and it was proved that Lindiman had shipped 40 chaldrons of coal more than he had "paid custome" for, the value of it being "fifty and odde pounds, all which, I humbly conceive, the state had been defrauded."

Forty chaldrons of coal worth 50*l*

(Signed) THOMAS MERITON,
Surveyor.

Newcastle-upon-Tyne, 28 March 1648.

Gardner adds to this:

"It is the old proverb *foul birds bewrayes their own nest.* If one ship could cheat the state so much as fifty odde pounds custome, what do hundreds of ships do?"

The *quantity of coal shipped about* 1655 from the Tyne may be gathered from the following extract from a petition to the Crown: A.D. 1655.

"The masters of ships desire only their due measure, and then they would not regard the odd chalder given to the score, all which they are debarred of, most unjustly, for commonly where ships takes in at Newcastle one hundred and thirty-six chalders, and expects to make at London two hundred and seventeen, or else looseth, besides having bad coals, a long voyage. There are computed three hundred and twenty coal keels, *alias lighters,* and every keel accounts to have carried every year eight hundred chalder of coals to ships, then judge how many thousand of London chalders is carried away

256,000 chaldron sent out of the Tyne yearly.

"JOHN WRENHAM.
"ROBERT REEX."

The following notes give a clear account of the coal trade of the North about this period:—

"COALES.—The chalder at Newcastle doth cost the masters of ships ten shillings the chalder, *Newcastle measure,* and one shilling custome, ordained by Queen Elizabeth.

Coal costs master of ship 10*s.* the chaldron and 1*s.* custom.

"For all coal carried beyond the sea by any Englishman, pays by the chalder for coals and custome, eleven shillings and fourpence, as by an Act of Parliament of the 28 March 1651 appears.

Coals sent foreign by an Englishman 11*s.* 4*d.* the chaldron (1651).

"For all coals carried by any stranger, payes the chalder double, being for custome per chalder two and twenty shillings eight pence, and argiere duties, &c., in all six and twenty shillings and ten pence custome, beside the price of coal and fraught.

Foreigners to pay double.

"For all coals at the market in every port, two shillings per chalder excise, towards building of frigets.

2*s.* chaldron excise towards building frigates.

"And for all coals sold by the tun, one shilling per tun; and for all Scotch coals two shillings sixpence per tun.

1*s.* the ton excise, 2*s.* 6*d.* the ton Scotch coals.

"And yet notwithstanding these impositions coals might be sold for twenty shillings the chalder all the year long, at London, with greater gain to the master and seaman, if ballast shoars were at or near the Shields.

"Provisions for the relief of the multitude of shipping, *about nine hundred sail,* and the inhabitants there.

900 ships loading coal in the Tyne, in the year 1651.

* An ordinance of Parliament (2 Octr. 1643) was issued to supply the poor and others with wood in lieu of coals, as Newcastle was surprised by the "papal and malignant forces."

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"Coals to be bought from the first hand, then there might be as many more voyages in the year as now they make."

The duty of 1*s.* a chaldron, which was imposed by Elizabeth, was regularly enforced to the time of Charles II. At the Restoration the quantity of coal imported into London is said to have amounted to about 200,000 chaldrons. The population of the city of London in 1631 was 130,268; supposing an increase in 33 years to 200,000 people, this will give a consumption of about one ton and a half to each head of the population. In 1670 these imports are stated to have increased to 270,000 chaldrons.

A.D. 1631.

Even at this period coal was but little used in any of the metallurgical works beyond the coal fields.

Sir John Pettus, in his *Fodinæ Regales*, by one or two notices proves that coal was not then used in the smelting and brass works in Cardiganshire. For example, he gives the following definition:*

"Coale. 1. Black, such as is burnt or charkt. 2. White, which is only baked in an oven to make it dry for fewele." This clearly applies to wood.

A.D. 1676. Sir W. Petty, in 1676, estimated the coal shipping of Newcastle at 80,000 chaldrons, but this does not agree with other statements made about the same time.

Duties were laid upon sea-borne coal to assist in building St. Paul's church and fifty parish churches in London; and in 1677 Charles II. granted to his natural son Charles Lennox, Duke of Richmond, and his heirs, a duty of one shilling a chaldron on coals, which continued in the family till it was purchased by Government. This impost, so troublesome to the Tyne coal merchants, and long known as the "Richmond shilling," produced soon after it came into the hands of the Government 25,000*l.* a year.

Richmond shilling, 1677.

A.D. 1799. It was purchased of the Duke of Richmond by the Government in 1799 for the sum of 400,000*l.*, after which time the whole amount, allowing 5 per cent. per annum interest, was more than redeemed by the income, an overplus of 341,900*l.* having accrued to the purchasers. It was relinquished by the Government March 1st, 1831.

Richmond shilling relinquished, 1831.

In 1699, 300,000 Newcastle chaldrons were shipped for London, of which two thirds were sent from Newcastle; and we learn that during the four years preceding 1710 that the export from Sunderland was 65,760 Newcastle chaldrons, and from the Tyne during the six years preceding that date there was an average export of 178,148 Newcastle chaldrons.

A.D. 1660 to 1690. If we bring this information into tons we have the following result:—

1660	-	265,571 tons	brought into London.
1670	-	355,821 „	„
1690	-	395,357 „	„

After this period the tables given on the following pages convey the most reliable account of the coal trade of the country. They show the actual quantities of coal brought into the port of London from each of the coal fields of the kingdom.

The following occurs in a fragment of a book printed probably about 1670 or 79. It shows how strong the prejudice was even then in regard to the use of coal.

"*An excellent invention to make a fire.*—Take three parts of the best New-castle coal beaten small, one part of loame, mix these well together into a masse with water, make thereof balls, which you must dry very well (a wood-cut follows here). This fire is durable, sweet, not offensive by reason of the smoke or cinder as other coal fires are, beautiful in shape, and is not so costly as other fire, burns as well in a chamber even as charcoal."

In a life of Mr. Locke we are told, 1679, that the Earl of Shaftesbury required Mr. Locke to return to London. "He accordingly returned thither, but not being wholly recovered, and finding "himself afflicted with an asthma, he could not tarry long at London, *the sea coal that is burnt there* "*being so very offensive to him.*"

The condition of the coal trade of the north of England in 1665 is shown by the preservation of a document relative to an early coal trade combination, of which the following is a copy:†

"Newcastle, 27th April 1665.

"At a meeting of the several principal traders in coals at the said town, upon a serious debate and consideration that there is a great quantity of coals now wrought and lying at pits and steaths, which, if it should please God trade should be open and free in a short time, cannot be vended in the ensuing summer, and that if more coals be wrought it will not only bring such necessity upon the owners of mines as that they will not have money to keep on their water charge and other necessary charges for preserving the colliery from being utterly ruined and rendered useless to themselves and the people in general, but the coals that are and may be wrought will become unfit for fewell, they have for the causes aforesaid unanimously agreed and concluded that from the first day of May next no coals shall be wrought at all in any of the collieries at the river Tyne, for ships' coal, until the coals now at pitts and steaths, that are merchantable, to be so near vended that the trade may be supplied with fresh and merchantable coals."

Regulation of collieries 1665.

This document was signed by twenty-two coal owners, each one affixing his name to some such note as the following:—

"I am content that my colliery wherein I am concerned shall lye in till the 29th September next.

"Fras. Liddle."

"For want of money I cannot carry on my work, and therefore I am content to let mine stand till 29 September next.

"Rob. Shafts."

"For want of money I promise to work no coals till 29th Septr.

"Heny. Maddison."

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* Fodinæ Regales, or the history, laws, and places of the chief mines and mineral works in England, Wales, and the English pale in Ireland, &c. By Sir John Pettus, Kt. London, MDCLXX.

† Collieries and coal trade before 1780. A coal trade curiosity. *Library of Mining Record Office*, Bell's Volumes, vol. 1.

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Twenty-five coal owners signed another agreement at the same time, "For raising the price to 13*s.* per chaldron." Price of coal 13*s* chaldron.

The practice of coal mining had arrived at such a degree of importance at the beginning of the eighteenth century, that we find treatises published, as guides to the system of exploration. One especially was "printed for G. Conyers, at the Ring, in Little Britain, 1708," in which the system of boring for coal, and sinking, are well described, and all the varieties of coal then employed are given with much accuracy.* 1703.

Many of the collieries were then extensive, and accidents were not unfrequent. The author of the above-named pamphlet informs us of a "blast" in October 1705. "There was above thirty persons, young and old, slain by a blast, perhaps in less than a minute's time." An explosion, 1705.

The report on the coal trade furnished for the meeting of the British Association in 1863, which was published with other reports, furnishes the following statement:† 1602 to 1750.

		Coast.	Foreign.	Tons.
1602.	The vend from Newcastle was - - -			190,000
1609.	Newcastle vend - -	214,305	24,956	239,261
	Sunderland - -	9,265	2,383	11,648
	Blyth - - -	855	—	855
1621 to 1862.	Newcastle - -	301,785	43,755	345,540
1622.	The port of Stockton began to vend coal at the rate of 10 chaldrons per annum.			
1630.	Newcastle - -	253,380	36,542	289,922
1660.	Newcastle and Sunderland - - -			537,000
1700.	Ditto ditto - - - -			653,000
1710.	Ditto 475,000 }			
„	Sunderland 175,000 } - - - -			650,000
1750.	Newcastle and Sunderland - - -			1,193,457‡

The gradual increase in the consumption of Newcastle coal is shown by the following table, which gives the quantities of coal sent to London from Durham and Northumberland from 1745 to 1765. From 1745 to 1765.

Years.	Durham and Northumberland. Newcastle, Sunderland, and Blyth.
	Tons.
1745	591,956
1746	625,482
1747	590,448
1748	599,399
1749	635,689
1750	583,341
1751	682,441
1753	647,515
1754	640,189
1755	678,352
1756	601,731
1757	687,831
1758	638,716
1759	575,581
1760	690,934
1761	636,195
1762	642,244
1763	718,359
1764	715,696
1765	763,383

The information contained in this table has been obtained, and those which follow in this chapter, from an official return (Custom House) dated 1765; the quantities therein given being in chaldrons, which have been reduced to tons by taking the London chaldron of 25½ cwts.§ as a basis.

* The Compleat Collier, or the whole art of mining, getting and working coal mines, &c., as is now used in the northern parts, especially about Sunderland and Newcastle, 1708.

† The Industrial Resources of the district of the three Northern Rivers, the Tyne, the Wear, and Tees; including the Reports on the Local Manufactures. Read before the British Association in 1863.

‡ We have every reason for believing that the above is a fairly correct statement of the condition of the coal trade at the periods named. It would have been more satisfactory if the authorities upon which those statements were founded had been given.

§ The London chaldron has been supposed to be the weight intended. It consisted of 36 bushels of 82 lbs. (12 sacks), or of 2,952 lbs. avoirdupoise. The Newcastle chaldron was 53 cwt. of coal. In London, if 5 chaldrons were purchased at the same time, the seller had to deliver 63 sacks. The three sacks additional were called *Ingrain*. (McCulloch, *Commercial Dictionary*.) The following shows the uncertainty attending this measure:

"A chalder of coals, Newcastle measure, is allowed by Act of Parliament to weigh 53 hundredweight (6 & 7 W. & M. c. 10. s. 2.); and as 8 Newcastle chalders are equal to 15 London chalders, reckoning 36 Winchester bushels to the London chalder, it follows that a chalder of coals, London measure, is equal to a little more than 28 cwt. But supposing 28 cwt. to be the weight of a London chalder, then the medium quantity of coal annually imported into London is 658,853 chalders; it may be collected that there are annually imported 922,394 tons."—*Chemical Essays by R. Watson, D.D., F.R.S., 3rd Ed., London*, 1784. *Vol.* 2., *p.* 360. Newcastle chalder or chaldrons.

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1777 to 1786. From 1777 to 1786 the average shipments from the northern coalfield were,—

To London and Coastwise	351,000 chaldrons.
To British Plantations	2,000 do.

The duty to the Crown on 351,000 chaldrons being 167,000*l.*, and the medium revenue derivable from the Duke of Richmond's shilling being 17,550*l.*

1772. In the Agricultural Survey of the county of Northumberland we find some returns of the exports of coal from 1772.* In the following table those returns have been taken, and a few additions made from Dunn on the Coal Trade.

		Total Shipments.		Quantity sent to London.	Probable Quantity sent sent Coastways or Foreign.†
		Chaldrons.	Tons.	Tons.	Tons.
In 1772.	Exported from Newcastle‡	351,890 =	932,503	—	—
1776.	„ „	380,000 =	1,007,000	893,296	—
1780.§	„ „	366,260 =	970,589	854,298	—
1784.§	„ the Wear	244,485 =	647,880	916,805	—
1785.§	„ the Tyne	499,997 =	1,324,992	936,214	—
1791.	„ Newcastle	444,909 =	1,179,000	1,051,862	—
1792.	„ „ ‖	490,682 =	1,300,307	1,072,759	790,048
	„ Wear	287,783 =	562,500		
1793.	„ „	486,133 =	1,288,252	1,020,650	—
1794.	„ Northumberland	257,462 =	682,269	1,003,640	—
	„ Durham	168,922 =	447,143		
1795.	„ Newcastle	505,650 =	1,339,972	1,126,893	1,047,829
	„ Sunderland	315,000 =	834,750		

A.D. 1780, 1790. From the "Report on State of the Coal Trade," made to the House of Commons in 1830, it is stated that in 1780, 657,302 chaldrons, and in 1790, 742,937 chaldrons, were brought into London from the northern coalfield.

A.D. 1795. Dunn, in 1795, gives the exports from Durham and Northumberland as 825,000 chaldrons, and he estimates the home consumption as 175,000 chaldrons, thus making the produce of those two counties as a million chaldrons, or 2,650,000 tons. The same authority informs us that the following were the numbers of people employed in and dependant on the coal trade in 1792:

On the river Tyne	38,475 persons.
On the river Wear	26,250 „
Total	64,725

Price of coal in London in 1761. Newcastle Chronicle. 1761. In 1760–61 coals were sold in London at 36*s.* the chaldron. This gave rise to much discussion in such channels of information as then existed. A writer, A. T. M., in one of the local newspapers, dating from Islington, Novr. 28, 1761, calling himself formerly a coal dealer, gives the following statement:—

	£	s.	d.
12 keels, or 96 Newcastle chaldrons, bought at 15*s.* per chaldron	72	0	0
Keel dues, Duke of Richmond's or coast duty, and other charges at Newcastle, 4*s.* per chaldron	10	4	0
Insurance, one per cent.	0	18	5
Orphan's duty, and other duties payable at London, 8*s.* 6*d.* per chaldron on 180 London chaldrons	76	10	0
Labour, delivering the coals out of the ship at 1*s.* 6*d.*	13	10	0
Lord Mayor's dues, Trinity charges, and other petty charges at 2*d.*	1	10	0
Discount, two one-half per cent. allowed the buyer on two-thirds amount of cargo, supposing the price to be 36*s.* the chaldron	5	2	10
Crimpage, one-half per cent on the whole amount of cargo	1	10	10
21 chaldron being sold to the score, allow for that	15	8	7
Usual allowance or gratuity made to the buyer	5	5	0
Interest of money advanced	1	15	0
	£212	14	8
180 chaldrons at 21 to the score makes 171 chaldrons 15 bushells and half at 24*s.* 9½*d.* is	213	13	7½

Hence it doth appear that when coals are sold at London at 36*s.* per chaldron the profit is 11*s.* 2½*d.* per chaldron (out of which the ship's freight only remains to be deducted).¶

A.D. 1768. In the year ending 5th July 1768, the duty paid on coal entering the port of London being 10*d.*

* General View of the Agriculture of the county of Northumberland, drawn up for the consideration of the Board of Agriculture and Internal Improvement. By J. Bailey and G. Culley, 3rd edition, 1805.
† Since the total exports from the northern rivers are not obtainable, it is not possible to give the other exports.
‡ According to Dunn on the Coal Trade, the quantity was 330,200 tons from the Tyne.
§ *Dunn.*
‖ *Dunn* gives 457,427 chaldrons.
¶ *Dunn, On the coal trade.*

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per chaldron, the amount received was 24,039*l.* 17*s.* 7*d.*; in 1778 this had increased to 27,860*l.* 13*s.* 6*d.*; in 1788 to 32,728*l.* 17*s.* 3*d.*; and in 1798 to 35,652*l.* 18*s.* 5*d.*,—showing a steadily increasing return.*

We have already noticed the quantity of Newcastle coal brought into London. It is necessary that we should return to the Northumberland and Durham coalfields, as there is preserved, in connexion with a system of taxation framed by the coal owners, and submitted to by the public, a series of returns which are of considerable value to us in considering the present question. The returns of the Newcastle coal field are more exact than those obtainable from any other, and as they bear a tolerably uniform proportion to the production of other parts of the kingdom they are especially useful, as enabling us to estimate approximately the total production of the kingdom in any given year.

1771. Combination of coal owners. "Limitation of the vend."

In 1771 there was formed a combination among the coal owners who shipped their coal by the three rivers, the Tyne, the Wear, and the Tees, to raise the price of the coals to consumers, by restricting the quantity supplied. This combination, known as the "limitation of the vend,"† lasted, with but a few temporary interruptions, until 1845. A committee appointed from among the coal owners held its meetings regularly in Newcastle-on-Tyne. This body fixed the price at which coals of various qualities might be sold when sea-borne for consumption within the kingdom. They also assigned the quantity of coal which during the space of a fortnight following each "issue" or order individual collieries might ship.

Upon opening a colliery, the first thing to be determined was the "basis" or rank which that colliery was to take. The coal trade committee appointed one referree, and the coal owner another. These men, taking into account the extent of the coalfield secured, the size of the pits, the number of steam engines employed, and other matters which indicated the amount of capital employed, fixed the proportionate quantity which the colliery would be permitted to furnish towards the general supply.

This system necessarily led to various schemes for securing the largest possible "basis." The proprietors burthened themselves in various ways, as by securing a royalty, extending over from five to ten times the surface which they intended to work, as by sinking pits at great cost which they had no idea of using, as by building twice the number of cottages which they required for the colliers, and by wasteful expenditure in every direction.

This Newcastle committee met twenty-six times in the year, and according to the prices in London determined the quantity which might be issued during the following fortnight.

Report of Committee of the House of Lords on the coal trade, 1829.

Mr. Buddle, in his examination before the Committee of the House of Lords, strove with great zeal to defend the arrangement, contending that the "object of the regulation is to enable the coal "owners to obtain something like a fair remunerating price to cover the expense of working their "coals, and to indemnify them for the investment of their capital and risk." He continues, "I should "contend that the coal owners have, in common with every other trade, an undoubted right to adopt "any measure they may deem expedient to enable them to obtain the utmost price the market will "afford." Mr. Buddle then contends that the coal owner has never been sufficiently paid, "when "the prices received by the coal owners to cover all expenses and risks are contrasted with the "charges on every other branch of the trade, they cannot but be considered as exceedingly moderate "by every reasonable person. The highest price which has ever yet been obtained by the coal "owners under regulations have not exceeded 18*s.* or 18*s.* 3*d.* per London chaldron on board ship "for the best coals. But while the first class have received these prices, the second and third class "have not obtained within 3*s.* to 10*s.* of it, and I believe the average of the whole has scarcely ever "reached from 12*s.* to 14*s.* per London chaldron."

All Mr. Buddle's arguments were, however, answered by the fact, that within a very short time the system of "regulation" was abandoned.

Manuscript volumes in the library of the Antiquarian Society of Newcastle-on-Tyne.

In the library of the Antiquarian Society of Newcastle-on-Tyne are some manuscript volumes containing information relating to the coal trade under this system, and amongst other matters are—

1st. The vend of coals in the Tyne, 1767. App., Table No. 1.
2nd. The vend of coals in the Wear, 1778. App., Table No. 2.
3rd. The vend of coals in the Wear, 1779. App., Table No. 3.

These important tables are printed in the Appendix.

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* List of Acts of Parliament regulating the duties payable on coal brought into the vicinity of London by canals:—

33 Geo. 3. c. 80. 1793.

No coal to be conveyed by the Grand Junction Canal towards London, nearer than the month of the tunnel at Langleybury, Herts.

35 Geo. 3. c. 8. 1795.

The line of the Grand Junction Canal varied; the boundary beyond which coal was not to be conveyed, altered from the tunnel at Langleybury to the north-east point in Grove Park, Herts.

Extract from Report from Select Committee on the Coal Trade (Port of London) Bill, June 13th, 1838, p. 157.

35 Geo. 3. c. 52. 1795.

No coal to be conveyed by the Wilts and Berks Canal nearer to London than Reading.

† Mr. Brandling explains the course pursued in the following words:—

"When it is understood by the coal owners that all the parties interested in the coal trade on the Tyne and the Wear are willing to enter into an arrangement of this nature, a representative is named from each of the collieries; these representatives meet together, and from amongst them choose a committee of nine for the Tyne and seven for the Wear, which is, I think, the number of collieries on the Wear. This being done, the proprietors of the best coal are called upon to name the price at which they intend to sell their coals for the succeeding twelve months; according to this price the remaining proprietors fix their prices. This being accomplished, each colliery is requested to send in a statement of the different sorts of coal they raise, and the power, of the colliery, that is, the quantity that each particular colliery could raise at full work; and upon these statements the committees assuming an imaginary basis, fix the relative proportions as to quantity between all the collieries, which proportions are observed, whatever quantity the markets may demand.

"The committees then meet once a month, and, according to the probable demand of the ensuing month, they issue so much per 1,000 to the different collieries; that is, if they give me an imaginary basis of 30,000 and my neighbour 20,000, according to the quality of our coals and our power of raising them is the monthly quantity; if they give 100 to the 1,000, I raise and sell 3,000 during the month, and my neighbour 2,000; but in fixing the relative quantities, if we take 800,000 chaldrons as the probable demand of the different markets for the year, if the markets should require more, an increased quantity would be given out monthly so as to raise the annual quantity, to meet that demand, were it double the original quantity assumed."—*Report of the Select Committee on the State of the Coal Trade, 13th July* 1830.

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By the first, we learn that 24 collieries were regulated to vend 359,000 Newcastle chaldrons or 951,350 tons. A note made in 1768 tells us that the "mean vend for three years past from the Tyne was 358,000 chaldrons," or 948,700 tons, and that it was agreed that the "intended vend for seven years to come should be 348,000 chaldrons," or 922,000 tons.

See Appendix, Table No. 4, p. 3.

From a series of documents relating to the coal trade which are preserved in the Mining Record Office we are enabled to give the vends from the Washington Staith for the years 1775, 76, 77, and 78, and 1781; and, in addition to these, the weekly vends for about 7 months in 1777.* These documents show in a truthful manner the method in which the coal trade was carried on in the northern rivers at this time. In 1777 a few daily and monthly vends are given.

Appendix, Table No. 5, p. 3.

Appendix, Table No. 5, p. 3.

In 1778, 15 coal owners on the Wear are found regulating their vend as 238,953 chaldrons, or about 633,225 tons, and in the next year 17 owners at 258,696 chaldrons, or 684,000 tons. The vend on the Wear in 1784 was 244,485 Newcastle chaldrons. A curious series of small vends are given from six coal owners in 1778.

Appendix, No. 6, p. 4.

We see by these vends that the quantity of coal shipped for *home consumption* from the Tyne in 1767 was less than a million tons, and the ten years later the vend from the Wear was under 700,000 tons. A table will be found in the Appendix showing the yearly exports from Newcastle and Sunderland from 1791, when 244,879 tons were shipped, to 1800, when the shipments had fallen to 125,952.

Appendix, No. 7, p. 4.

Foreign coal trade.

The restrictions enforced by the "limitation of the vend" did not apply to coal shipped to foreign ports, consequently the coal owners endeavoured to force a trade in that direction. The consequence of this was, that frequently coal was sold to foreign markets at 40 per cent. under the prices in the London market. To such an extent was this carried that English coal was sometimes to be purchased in St. Petersburg at half the price of the same coal in the River Thames.

Appendix, No. 8, p. 4.

Coal from Midland counties. 1791, 1799.

At this time, there was a growing feeling in favour of obtaining coal from the Midland and other coal-producing counties, at which the Northern coal-owners evidently became alarmed. The evidence of this is to be found in a letter addressed to John Whitmore, Esq., by Henry Grey Macnab.† From this letter we learn that the following quantities of coal were exported in the years 1791 and in 1799 from the ports of Newcastle, Sunderland, Hartley and Blythe:—

	To Foreign Countries.	Coastwise.	London.
	Tons.	Tons.	Tons.
1791 - -	264,944	289,658	1,075,956
1799 - -	125,959	938,204	1,150,202

And then in the ten years included they exported from these ports:—

	Tons.
To Foreign countries - - -	1,585,349
To London - - - -	9,929,934
Coastwise - - - -	7,192,476
Total export in ten years - -	18,707,759

Appendix, No. 9, p. 5.

	Tons.
The total exports from the Northern ports in 1791 were - -	1,630,558
The total exports from *the other* ports of the kingdom were -	355,973
Total export of coal in 1791 - - -	1,986,531

Appendix, No. 9, p. 5.

The total export of coal from the Northern ports in 1799 were -	2,214,365
The total exports of coal from *the other* ports of the kingdom were -	349,065
Total export of coal in 1799 - - -	2,563,430

Appendix, No. 10 p. 5.

In another return giving the quantities of coal exported from the ports north of the Humber, we find the total exports in 1795 given as 2,210,161 tons; and the total exports of 1799 given as 2,237,404 tons. The discrepancies arise from the uncertainty connected with the conversion of measures into weights.‡

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* Miscellaneous documents on coal in Mining Record Office.

† A letter addressed to John Whitmore, Esq., pointing out the impolicy of the *proposed measure* of obtaining a supply of coal from the manufacturing districts to the Metropolis: by Henry Grey Macnab, 1801.

‡ The Newcastle chaldron of coals varies with the coal as follows

	Cwt.	qrs.	lbs.
1 chaldron of Wallsend, Stewart, weighs - - -	54	2	24
" Eden Main " - - -	51	0	12
" Primrose " - - -	50	3	16
" Fawcett Main " - - -	50	2	9
" Nesham " - - -	49	3	14
" South Moor " - - -	49	2	15

The mean average of these weights is 51 cwt. 0 qrs. 13 lbs.

The London chaldron of coals also varies as follows:

	Cwt.	qrs.	lbs.
1 chaldron of Russell's Hetton Wallsend weighs - -	25	0	8
" Lambton's Wallsend " - -	25	3	9
" Russell's Wallsend " - -	25	0	0
" Northumberland " - -	25	1	25
" Tanfield Moor " - -	26	0	17
" Stewart's Wallsend " - -	26	0	18
" Killingworth " - -	25	0	13

The mean of these being 25 cwt. 2 qrs. 4 lbs.

Mr. Joseph Taylor, in his evidence before the House of Commons, 6th April 1830, said, "The Newcastle chaldron is rather better than two of London; it is as 8 to 17."

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The exportation of coal from the Tyne and Wear about 1793 is given, by one evidently well qualified to furnish information, as follows:* Exportation from Tyne and Wear, 1793.

	Chalders.
Sea-borne coal to London	900,000
„ „ coastwise	700,000
„ „ foreign export	250,000
Coal consumed at NEWCASTLE	450,000
The total annual consumption from those two rivers	2,300,000

This, considered to be in imperial chaldrons, which must have been intended, (as the shipments north of the Humber in 1800 did not reach three millions,) represents 2,875,002 tons.

The natural tendency to make exaggerated statements, when great interests are at stake, is traceable in this return, as will be evident by comparing it with the tables given above, and the more detailed statement in the Appendix. This tendency destroys the value of this return, but on most other points those letters may be consulted with advantage, as the information is generally of a reliable character.

The shipments of coal from Newcastle and Sunderland from 1791 to 1800, the coals shipped from other ports of the United Kingdom from 1790 to 1800, together with the tables giving the shipments for the same dates from Scotland, and the shipments from Wales, and especially Swansea, will give a good view of our coal trade at this period. The table relating to the coal trade of London will also afford much valuable information, showing as it does the influence of war and peace upon the coal consumption of our metropolitan city. From 1775, when London received 846,955 tons of coal, to 1800, when 1,281,824 tons, there appears to have been a regular increase, notwithstanding a few unimportant undulations. Between 1768 and 1799 the duties collected of 10*d.* per chaldron increased from 24,039*l.* to 34,951*l.* Appendix, Table No. 10. Appendix, Tables Nos. 11, 12, p. 5. Appendix, Table 13, p. 6. Appendix, Table 14, p. 6. Appendix, Table 15, p. 6. Appendix, Table No. 16, p. 7.

The feeling shown, when Mr. Pitt attempted to put a tax on coal, may be judged from an article which appeared in the "*English Chronicle.*" It bore the title of "Sunderland's Surprise, or P's Budgett "open'd. Showing how His M——ty's present Minister means to inflict slavery on the Loyal and "Free Miners of the River Tyne." The English Chronicle. William Pitt's taxation.

"At a numerous meeting of the several persons taxed, male and female, in Hyde Park yesterday "afternoon at three o'clock, it was resolved, *nemine contradicente*, that the young imposer of taxes "should for his unpopular and unmanly imposition be chastised in the following manner." Then follow the punishments to be inflicted by each trade. To give examples of two divisions only:—

"The ribbon weavers shall bind him with fillets, preparatory to the Cyprian corps tossing him in "gauze."

"The colliers shall prepare a fire to roast him, and all the poor in the kingdom shall lard him "with curses;" and so on.

From returns furnished by the Customs of the vends of the Northern ports, we find as follows: 1791 to 1800.

Years.	Coastwise Vend.	Foreign Vend.	Total Vend.
	Tons.	Tons.	Tons.
1791	1,814,661	264,944	2,079,605
1795	2,251,547	418,885	2,670,432
1800	2,381,986	138,089	2,520,075

In the Appendix will be found a table giving the winter and summer prices of coal in 1785 at most of the principal ports of the kingdom. Appendix, Table No. 17, p. 7.

CUMBERLAND.—In 1582, the Earl of Lincoln, being Lord High Admiral, caused an account of the ships and mariners within Cumberland to be taken. The vessels amounted to twelve, not one of them being of 80 tons burden. Mariners and fishermen, 198.† The insignificant condition of the ports of Cumberland, even so late as the middle of the eighteenth century, is shown by the facts that in 1752 Maryport consisted of only one farmhouse, and in that year a second house was built. CUMBERLAND.

Coal was first worked at Whitehaven by Sir John Lowther in 1660; but we have not been able to discover any record of the quantity raised until towards the end of the 18th century.‡ Lyson informs us that steam engine fuel was used in 1787, in which year the Whingill and Howgill Collieries produced 112,500 tons of coal. Whitehaven, 1660.

The average annual export of coals from this coalfield, computed from the returns of eleven years (1781 to 1792), was: Appendix, Tables Nos. 18, 19, p. 7. 1781 to 1792.

	Chaldrons.
From Whitehaven	81,940
„ Workington, Harrington, and Maryport	70,870
Total	152,810 chaldrons.
Equal to 194,832 tons.§	

* Letters addressed to the Right Hon. William Pitt, 1793.

† A General View of the Agriculture of Cumberland.

‡ Lyson, Magna Britannia, p. cxxi. Ibid., p. cxxii.

§ There are considerable difficulties in determining the weights at different periods and places. We at first supposed this coal coming from a northern port must have been given in Newcastle chaldrons, but the quantity thus produced is far too large; therefore we have regarded it to be the Imperial or London chaldron. The following information, applying to a more recent date, may be useful:

"In 1826 our wagon contained about 24 Carlisle bushels, and weighed a little above 2 tons; and 36 imperial bushels were "called a chaldron. (The Carlisle bushel, 3 Streaked Winchester bushels, used to weigh from 1 cwt. 2 qrs. 21 lbs. to 1 cwt. 3 qrs.) "The wagon was usually calculated at 2 tons." Another correspondent writes, "At Whitehaven, about 25 years ago, the weight "of the wagons were 48 cwt.; they were then increased to 50 cwt., at which weight they now stand. They call this a chaldron "wagon." Cumberland wagon. Cumberland chaldron. Cumberland chaldron wagon.

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The duty on coal exported from Cumberland was 1*s.* 2*d.* to Ireland, and 5*s.* to Foreign ports.

Exports to Ireland.

Of the above quantity, considerably the largest portion was sent to Ireland. We have no means of ascertaining how much went to any other port than London.

The coal trade of Cumberland was clearly becoming important when M. Jars visited the district in 1774.* He writes,—

1774.

"On prétend que les mines de charbon des environs de *Whitehaven*, *Workington*, *Harrington*, et *Maryport*, produisent chaque jour mille tons charbon, dont chacune pesse quatorze quintaux de cent-douze livres. Ce charbon est pour la plus grande partie envoyé en Irlande, et se vend à bord des vaisseaux trois schelings et demi la tonne ci-dessus. On estime le droit du Roi, pour le charbon qui est exporté, environ un scheling par chaldron de Newcastle."

Trade with London, 1746 to 1764.

At this time attempts were made to open a trade with the Metropolis, but those attempts do not appear to have been attended with much success, as the following table of coals shipped for London from Whitehaven shows:

	Tons.
1746	9
1755	49
1756	395
1757	72
1758	84
1760	156
1764	234

Appendix, No. 18, p. 7.

From 1781, when 119,540 tons were shipped from Whitehaven, unto 1792, when 125,340 tons were shipped, there does not appear to have been any advancement in the coal trade of this port. From the three other ports, Workington, Maryport, and Harrington, however, coal was exported with a

Appendix, No. 19, p. 7.

marked advance in each year. In 1781 the export was 118,525 tons, and in 1792 169,291 tons. This information is obtained from Hutchinson's History of Cumberland.†

The same authority informs us that—

Iron works, 1763.

"Between Workington and Seaton, on the banks of the Derwent, are considerable ironworks, called Seaton Works, planned and built under the direction of that eminent engineer, the late Thomas Spedding, Esq., of Whitehaven, in the year 1763. They have two blast furnaces for the melting of iron ore, a mill for slitting and rolling of bar iron, a double forge for refining and drawing of bar iron, a foundry with several small furnaces, wherein they make cannon and cast iron-work of all sorts, a boring mill for boring cannon, cylinders, &c., a grinding house and turning house, and many other conveniences for carrying on a very extensive iron manufactory. These works are carried on under the firm of Spedding, Hicks, and Company."

In 1794, we learn from Hutchinson that—

A.D. 1794

"The coal trade is of the greatest importance. There are two sets of workings almost contiguous to Workington. Nine pits belong to Mr. Curwen, and five to Mr. Walker, as agent to the trustees of Anthony Bacon, Esq., M.P. London. They generally ship, on account of both parties, about an hundred and fifty waggon loads per day (Sunday excepted), of which Mr. Curwen ships near an hundred loads. Each waggon contains three English tons of coals, for which the owner of the vessel is charged ten shillings and sixpence. The three English tons exceed in some small degree two Irish tons; the prices at the Irish markets vary. The profits to the shipping are very uncertain. No capital of such extent makes so poor a return; it barely affords a living profit to the industrious and careful. The shares are divided into small parts, and are generally taken to oblige some individual, rather than with the view of much advantage. The collieries here have their obstructions, or troubles, as the miners call them, equally with those at Whitehaven, and other places on this coast. The pits are from forty to ninety fathoms in depth, having generally two or three workable bands; the first, three feet, the second, four feet, and the third, from ten to eleven feet. The roofs of the two former vary; that of the main coal is of the finest white freestone, generally twenty yards in thickness. Mr. Curwen is at this time employed in endeavouring to open the Chapel-bank colliery; the shaft now sinking is upwards of twelve feet diameter. There are two fire engines upon it; the pumping engine one of the most powerful ever erected in Cumberland."

Lancashire.

Lancashire Coalfields.—That but little coal was used in this district in any metallurgical process in the reign of Elizabeth is proved by the fact that a petition was made to the Crown, that "the bloomaries in High Furness might be abolished, on account of the quantity of wood which was consumed in them for the use of the mines, to the great detriment of the cattle."‡ Whether coal was employed in the place of wood is exceedingly uncertain. It is curious that this is the only district in the United Kingdom in which charcoal is now (1871) used in the manufacture of pig iron.

Elizabeth, 1570.

The consumption of coals in the manufactories at Ravenhead in 1795 amounted to 700 tons per week.§ The manufactures are iron and copper works, plate glass, white lead, lamp black, vitriol, alkali, and sugar refineries.

Bridgewater canal.

The development of the Lancashire coalfield was greatly assisted by the Bridgewater canal. "A l'aide de ce canal, le Duc de Bridgewater se procurera non-seulement la consommation de son "charbon à *Manchester* mais aussi à *Liverpoole*, ville très considérable par son commerce et son port "maritime."‖

Cheshire.

Cheshire Coalfield.—Coal is said to have been first opened in Nerse township in 1750. Our information is exceedingly meagre, the following, showing the coal sent to London between 1747 and 1763, being really all that we can obtain.

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* Voyages Métallurgiques, ou recherches et observations sur les mines & forges de fer, la fabrication de l'acier, celle du fer-blanc, & plusieurs mines de charbon de terre, faites depuis l'annee 1757 jusques & compris 1769 en Allemagne, Suede, Norwege, Angleterre, et Ecosse. Par M. Jars, MDCCLXXIV.

† History and Antiquities of Cumberland by Mr. Hutchinson. Carlisle, 1794.

‡ Guide to the Lakes. Hudson. Kendal, quoting J. Prior. Hagustel, c. 288.

§ Fossil Fuel, p. 209, 1795.

‖ Jars' Voyage Métallurgiques, 1765.

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Coals brought into the port of London in each of the following years.

Coal sent to London, 1747 to 1765.

Years.	From Chester.	From Liverpool.	From Preston.	From Lancaster.	Total Quantity.
	Tons.	Tons.	Tons.	Tons.	Tons
1747	—	—	11	—	11
1749	—	11	64	—	75
1750	20	5	—	—	25
1751	—	10	—	—	10
1754	—	11	58	—	69
1755	5	—	95	—	97
1756	14	24	107	—	145
1757	29	96	83	—	208
1758	—	2	—	—	2
1759	—	12	—	1	13
1760	—	3	—	—	3
1762	—	1	—	—	1
1763	—	12	—	—	12
1764	103	—	—	—	103
1765	—	223	—	—	223

YORKSHIRE AND MIDLAND COALFIELDS.—The early history of coal mining in Yorkshire is very obscure. YORKSHIRE.

A local newspaper* informs us that in 1752 a petition was prepared for Parliament, for rendering the Calder navigable, the chief object being the conveyance of coal. 1752.

The use of coal was, however, limited at this time, and charcoal was still used extensively. We are told that at Halifax, October 17, 1758, two young men were destroyed in a charcoal burner's hut. Amongst the accidents recorded in the "Leeds Intelligencer" is, a *coal boat* sunk on the Calder, two miles below Wakefield, three men drowned, and the fourth swam to the shore; it is not clear whether coal or charcoal is intended. At this time there was great activity in the direction of inland navigation. And the same newspaper informs us, the subscription for making a "Navigable canal from Leeds to Liverpool" fills apace, upwards of 100,000*l.* being subscribed, &c. July 5, 1768. January 31, 1769.

The Leeds and Liverpool canal was opened from Liverpool to Newborough in 1775, from Leeds to Holmbridge in 1779, and from Foulridge Tunnel to Burnley in 1796. The following statement of the Leeds and Liverpool Canal and Douglas Navigation will convey some idea of the coal trade of this period: Leeds and Liverpool canal. 1783 to 1794.

	Yorkshire.	Lancashire.	Tarlton.
	Tons.	Tons.	Tons.
January 1783–1784 - -	17,503	57,375	11,007†
„ 1793–1794 - -	32,800	185,378	34,316

At Middleton Wood, the estate of Mr. Brandling, near Leeds, in May 1758, some new operations were begun in a shaft which had been sunk in a former year to a depth of *sixty yards*. There was an explosion of firedamp in this pit to which especial attention was called.‡ A.D. 1758.

Mr. John Hardy, of Bradford in Yorkshire, refers to vast fields of coal in the neighbourhood of Leeds, Wakefield, Barnsley, and Bradford. "No less than 150,000 to 200,000 acres," which might be conveyed by canal, and shipped on the Humber.§

Coals brought into the port of London in each of the following years.

Years.	From Hull.	From Boston.	From Lynn.	Total Quantity.
	Tons.	Tons.	Tons.	Tons.
1745	5	9	—	14
1746	4	—	—	4
1747	44	—	—	44
1748	143	—	—	143
1750	76	—	—	76
1751	4	4	—	8
1753	22	—	—	22
1754	10	—	—	10
1755	38	—	—	38
1756	464	—	—	464
1757	706	—	—	706
1758	181	—	34	215
1759	217	—	—	217
1760	237	—	—	237
1761	65	—	—	65
1762	56	—	—	56
1763	25	—	—	25
1764	153	—	—	153
1765	439	—	—	439

* The "Leeds Intelligencer," preserved in the Leeds Philosophical Institute.

† All this went to Liverpool, the 11,007 tons to Tarlton being for shipment or for Preston by the river Ribble. *The Leeds and Liverpool ton was 22 cwt. by Act of Parliament.*

‡ A letter from Mr. Bernard, of Deptford, to Mr. Robertson, Lib. R. I., containing a short account of an explosion of air in a coalpit at Middleton, near Leeds, in Yorkshire. *Phil. Trans.*, vol. lxiii., p. 217.

§ Evidence on Yorkshire report of committee on inland coal trade, 1800.

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DERBYSHIRE. A.D. 1789.

DERBYSHIRE.—The following is only valuable as showing the extent to which the Derbyshire coal seams were known when Pilkington wrote* :—

"Coal, as I have already had occasion to observe, is found in *great abundance* in Derbyshire. Though various in its nature and properties, it may be comprehended under the two general divisions of *soft* and *hard*.

Soft and *hard* coal of Derbyshire.

"*The 'soft' coal*, which lies much nearer to the surface, is found in most of those shafts in which the other sort is met with. It is generally shattery and sulphureous. It is much used for burning limestone and the manufacture of iron goods. A large quantity is also converted into coak.

Uses of "soft" coal.

"*The 'hard' coal*, which is more useful and valuable, is more varied in its nature and properties. I shall endeavour to distinguish it according to its different quality at the several places at which it is found.

"At Smalley, West Hallam, and Ilkeston the coal is of a shining and lamellar texture, &c.

"At Heanor and Shipley the hard coal is of a dull, scaly, compact, and solid texture, &c.

"At Denby, Ripley, Swanwick, and Alfreton the hard coal partakes of the qualities of the two sorts which have been described ; is of a scaly, moderately compact, and rather bright texture, &c.

"At Normanton and Blackwell the hard coal agrees in most its properties with that which is last mentioned, &c.

"At Chesterfield and Eckington the hard coal is but little sulphureous, and yields a large quantity of ashes.

"That which is found at Newhall and Measham is very nearly of the same kind.

"The coal near Buxton is shattery and exceedingly sulphureous."

The following, on the iron manufacture of Derbyshire, helps us to some information from which we are enabled to compute the quantity of coal used in 1789 in the iron making.

Iron manufacture, 1789.

"By mixing the ore, flux, and fuel in different proportions, different kinds of metal are produced. When that from which shot and ballast are made is wanted, it is customary to every nine baskets of ore to add four of coak and two of limestone. But with this quantity of fuel and flux it is not necessary to mix more than seven baskets of ironstone to produce forge metal. When soft metal from which cast goods are made is required, it is usual to put five and a half of ore to four of coak and one and a half of limestone. * * * * *

"Charcoal, which produces a greater degree of heat than *coak*, is never used in so large a quantity for obtaining any particular kind of metal; but wood being a scarce article in Derbyshire cannot be procured with so much ease and at so moderate an expense as coal. For this reason charcoal is not at present employed for smelting ironstone in any part of the country with which I am acquainted. * * * * *

Make of pig-iron, 1789.

"The quantity of iron which is annually produced in this county has lately been very considerable. *At present it amounts to about* 5,600 *tons*. This estimate was made by taking an average account of the metal which was extracted every week at the several furnaces in the county."

Pilkington is very brief in his description of the Derbyshire coal mines; but it is evident that a good many collieries were at work when he wrote his "view." The following quotations appear to contain nearly all the information Pilkington has to give :—

"In working mines of coal, water and foul air are often found to be very troublesome. To relieve them from the latter they have recourse to the same means which are employed in lead mines. But to free the pits from inflammable and mephitic air, with one or both of which they are often troubled, a method somewhat different is used. At most works there is, besides the large shaft, by which the coals are drawn up, a smaller one at a distance of a few yards. This is about 4 feet wide, and 15 or 16 feet deep, and from the bottom of it a pipe is carried into and down the larger shaft to that part of the mine where the men are at work. A vessel of burning coal, holding about four pecks, is then suspended in the smaller shaft. By this contrivance the air is immediately rarefied, and a fresh column rushing upwards to supply its place, a circulation is produced and maintained in every part of the mine.

Quantity of coal got.

"It is scarcely possible to ascertain the exact quantity of coal which is got in Derbyshire every year, but it is certainly very large; for besides what is consumed in the neighbouring country, a considerable quantity is conveyed by the Erewash Canal into Leicestershire."

Glover, in his history of the county of Derby,† gives a list of collieries "which are or have been worked in Derbyshire." As this list contains much valuable information, it is given in the Appendix, and also a list of the collieries in Derbyshire and the immediately adjoining counties by John Farey. He informs us in his somewhat bald history of coal mining, that "It appears, however, from a charter "of Edward II., dated 1315, that the coal of this county was in use, and that the Lord of Alfreton, "Thomas de Chaworth, granted to the monks of Beauchief permission to supply themselves from his "domains of Norton and Alfreton."

Appendix, No. 20, p. 8, No. 21, p. 11.

Glover continues:—"The old coal pits or workings were upon the edge or basset, where the strata "appeared immediately under the vegetable soil or thin alluvial covering. These were afterwards fol- "lowed until (as the colliers express it) the mineral had *got cover* under the yellow limestone, grit, or "other upper stratum, and there the beds or measures, whether coal or other mineral, are always more "valuable than near their bassets, *in the open works or shallow pits, to which the getting of coals seems to* "*have been long confined.* When coal became an article of general consumption, about the beginning "of the 17th century, great researches were made for the discovery of that important mineral, and "some superstitious practices necessarily were resorted to, in the then general deficiency of geological "information."

A.D. 1600.

Why "superstitious" is not apparent. What the superstitious practices were is not stated. The divining rod had not yet been introduced by the German miners into this country. We are not aware, indeed, that it was ever used in the search for coal.

A.D. 1831.

"The coals of Derbyshire are for the most part worked by lessees, but above eight or nine great

* A View of the Present State of Derbyshire, with an account of its most remarkable antiquities, &c. By James Pilkington. Derby, MDCCLXXXIX.

† The History and Gazetteer of the county of Derby. The materials collected by the publisher, Stephen Glover; edited by Thomas Noble, Esq., Derby, 1831.

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andowners work the pits on their own account, except for their own or their neighbours' consumption. Collieries are generally let by the acre of coals that are worked, ascertained annually by survey and measurement of the subterranean works. Mr. Farey states the rents to be from 50*l.* to 180*l.* an acre, according to various circumstances. Other coal owners reserve a fixed rent, which varies from 4*d.* to 16*d.* upon every ton sold at the pit."

A section of the pit at Shipley is given, which was then the deepest coal mine in the county. Its depth was 244 yds. 1 ft. 3 in.*

Explosion of Wingersworth.

Some account given by Plott of an explosion in a pit at Wingersworth prove that coal had been worked at the date of the publication of his history in the Chesterfield district.

Mr. Joseph Wilks informs the House of Commons Committee on the Inland Coal Trade:†—"That "where the Ashby canal is projected, the best veins of coal lie from eighty to one hundred and "twenty yards deep, and are from three to seven feet thick; but as there are no manufactures near, "and no encouragement to carry on those works, the coal is now sold at from 4*s.* to 7*s.* per ton of "120 lbs. to the cwt. and 21 cwt. to the ton." The Leicestershire coals are thought by Mr. Robert Edington to be worth about 31*s.* a chaldron, brought to London by inland navigation free of all duty.

The Derwent. A.D. 1719.

An Act was obtained in 1719 to make the River Derwent navigable to the town (Derby), which opened the markets for heavy goods, such as were before excluded through bad roads and expensive conveyance.

The Derby canal. A.D. 1793.

The Derby canal, for which an Act was obtained in 1793, superseded the Derwent navigation. "Heavy goods from London to Derby, by sea to Hull, and from thence by the Trent navigation, are conveyed at 20*s.* per ton by inland navigation; by boat from Derby to Birmingham at 20*s.*‡

Canals, 1793.

"Vast quantities of coals are annually sent out of the counties of Derby and Nottingham southward, by means of the following canals:—Cromford, Derby, Erewash, Grantham, Leicester, Melton Mowbray, Nottingham, Nutbrook, and Trent canals or navigations, and others with which these connect."

About this period the prevailing tendency to increase the facilities of communication was as remarkable as the so-called "railway mania" of our own times. Between 1770 and 1800 no less than 113 bills for the construction of canals, or the improvement of river navigation, were brought before Parliament. (*See List of these in Appendix.*)

Appendix, No. 22 p. 14.

Staffordshire &c.

Staffordshire, Warwickshire, Shropshire, &c.—Cambden, in his Natural History of Warwickshire,§ speaks only of "two coal mines at Bedworth." In Gough's Cambden we are told that Sir Roger Newdigate, Bart., had one of these coal mines, "from which he made a cut to communicate with the "navigation. There is a wheel of 36 feet diameter, which throws out the water and draws up the "coal at the same time."‖

A.D. 1794.

In 1794 there were considerable coal mines about Bedworth, Griff, Chilvers Coton, Oldbury, and extending in the same line near to Atherston, Polesworth, and Wilncot.¶ They are of a sulphureous quality, but make durable hot fires, and are sold from threepence to fivepence per hundredweight at the pits.

In Wednesbury, Dudley, and Sedgley in 1785 there were twelve or fourteen collieries at work,** and twice as many out of work, some of which afford 2,000 tons yearly, others three, four, or 5,000 tons

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* Plott's Staffordshire, p. 136.

† Evidence on Leicestershire and Derbyshire. Report of Committee on Inland Coal Trade, 1800.

‡ The *ton* has been the usual denomination by which these coals are sold to the boatmen and dealers.

§ Cambden, Magna Britannia, vol. v., p. 876, A.D. 1730. Britannia, &c., by William Cambden: translated from the edition published by the author in MDCVII;—enlarged by the late discoveries by Richard Gough. Vol. 2, p. 464.

‖ Mr. Llewellynn Jewitt favors us with the annexed, extracted from the "Reliquary," vol. 2, p. 47 :—

The following interesting account of the Derbyshire coal trade in the year 1693, which contains many curious particulars, I copy from that singular book, Houghton's "Husbandry and Trade Improved." Only fancy, coals delivered to your own door at threepence and threepence halfpenny the hundredweight; and then, again, fancy such a town as Derby with "not one wholesale tradesman" in it. LL. Jewitt.

"I have an account from an ingenious man of Derby that there is not one wholesale tradesman in the town; that lead costeth seven shillings the fother carriage from the smelting-mill to Derby, and half a crown more down to the ferry, from whence 'tis carried by water to Hull; also abundance of lead is carried over the country to Nottingham Bridges from Critch and the mills about Wirksworth, where there is a barmoot court to determine matters between miners every Tuesday, their market day. Abundance more lead is carried from Chesterfield and all that side to Bawtree, from Sheffield and all those parts to Doncaster, and so to the German Ocean.

"That hops grow not in those parts, but the country is chiefly furnish'd from Sturbridge Fair and Shrewsbury. That the chiefest coal mines thereabouts are at Smaly, four miles, at Heaner, six miles, and at Denby, five miles from Derby, thro' which abundance in summer are carried as far as Northamptonshire, from whence is brought back barley. Those coals at Smaley and Heaner are in the hands of one Mr. Samuel Richardson, who finding that Derby consumed annually about three thousand loads, besides what was fetch'd into Leicestershire and Northamptonshire, design'd to sell his coal for threepence the hundred, and had got them to six shillings and sixpence the load; but the worshipful John Lowe, of Denby, Esq., after an expense of between nine hundred and one thousand pounds in perfecting a sough to lay his delf dry, the last spring accomplisht the same, and has laid as many coal dry as will be got this forty years, and before the sale came he had got above one thousand loads upon the bank, any of which he upholds to be at least five and thirty hundredweight, and sells them for five shillings sixpence; so that this year we bought coals delivered for threepence halfpenny the hundred.

"These coals are drawn up by a horse as in a malt mill, where there is a barrel, on which a rope winds; so that while one end winds up, the other goes down through the pulleys, and so contrary, the particular description whereof I have, but 'tis not easy to those who are not artists therein without a cut.

"At Smaley my friend went down the pit twenty fathom by ladders of twelve staves each, set cross the pit one by another. When he was so deep, he went underground (he believes as far as from my house to St. Paul's Church, which is well near half a mile) in a mine or vein, which was above six foot, where were coals over head and under foot, the workmen knew not how thick. From this place he was led twenty yards through a narrow passage upon hands and feet till he came into a large space, which was the head of a sough (a place to carry away water) which laid all the pits dry that were on that level, and presently he came to a pit twenty yards deeper than before, out of which they drew water brought from another pit twenty yards deeper with two vessels which would hold above sixty gallons each; they were hoopt with iron, and biggest in the midst. When one of these came to the top a boy with a hook drew them to him, and easily did throw the water down, which in that concave made a noise like thunder.

"There is in Derby a soap boiler who drives a great trade, and his predecessor got out of it a good estate. And one Mr. George Sorocold has set up a water house to convey water-pipes to all the houses in the town that desire it, and 'tis likely it will be much used.

"Next Friday expect more from Derbyshire, from yours, John Houghton, F.R.S."

¶ General View of the Agriculture of the county of Warwick. By Mr. John Widse. Drawn up for the consideration of the Board of Agriculture and Internal Improvement, 1794.

** Plott's Staffordshire, p. 27.

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per annum. From this we may estimate with tolerable correctness that the total quantity of coal produced in those three important districts did not exceed 50,000 tons.

Plot, p. 84, on the thick coal.

Plot also tells us, "At Ettingshale in the parish of Sedgley, at a place called Moorfields, coal lies "14 yards thick, sold for 100*l.* per acre, and in one case 150*l.* per acre." We incidentally get a paragraph informing us that "for burning a clamp of bricks they use 7 tons of coal.

Burning bricks.

The following from Jars* show that in 1774 coal mining was active in North Staffordshire, "Tout "aux environs de la ville Newcastle-*Under-line* dans le comté de *Stafford* on exploite une très-grande "quantité de mines de charbon de terre. Le Roi a le *Royalty* de plusieurs milles à la ronde, mais on "ne se sert pas du mot de *Royalty* dans ce pays la. On dit les mines appartiennent au Roi, parce-"qu'il est le *Lord of the Manor*."

Sturtevant's Metallica, 1612.

Some idea of the extent of the iron manufactory at the commencement of the 17th century may be gathered from the following argument used by Simon Sturtevant in his "Metallica" to prove that pit coal could be used with great economy.†

"There are planted already in England and Wales eight hundred milnes for the making of iron, for there be foure hundred milnes in Surry, Kent, and Sussex, as the townsmen of Haslemore have testified and numbered unto mee, there are also 200 milnes in Wales and 20 in Nottinghamshire, as the author hath been credibly informed. Now wee may well suppose, that all England, Scotland, and Ireland (besides the fore-named shires), will make up the number of 180 milnes more, being in all 800 milnes. Moreover, one milne alone spendeth yearly in charcoale 500 pound and more, as diuerse clarks and workmen in iron businesse haue credibly testified, which in pit coale will be done with the charges of 30 or 40 pounds after the inuentioners manner and intention, or at the most with 50 pound where carriage is farre and chargeable."

Metallica, 1612.

At this time we learn from the same treatise, that in 1612 sea coale "is now used as effectually and "as to as good a use and purpose" for "brick making, brewing, dying, and casting of brass workes." Again Sturtevant tells us that "the blacksmithe long agone forged all his iron with charcoale, but these many years small *sea-coal* hath and doth serve the turn as well and sufficiently;" again, as a proof how steadily coal was coming into use, "Adde hereunto, that very lately by a wind furnace, green glass "for windows is made as well by pit coale at Winchester house in Southwarke as it is done in other "places with much waste and consuming of infinite store of billets and other wood fuele." It is curious and instructive, as showing how closely the conditions of fuel were being investigated at this time, when wood is becoming very scarce, to read the following definition of "the three sorts of fewele "whereof fier is made."

"1. *Wood fewele*, which is either charcoal or unburnt wood fewele.

2. *Pit coal or earth coal.*

3. *Brush fewele.*

"*Charcoal* is the principal and best for use, but by reason of scarcity it is grown very dear in our country."

"*Earth cole* is that kind of fewele of firing which is digged out of the bowels of the earth, of which sort also there are many kinds having difference in their burning."

"The Scottish coal is the best flamer, and consumeth away into white ashes, as having in it more vnctiousnesse than sulphurousnesse.

"The Newcastle coale, usually called *sea coale*, is more lasting than the Scottish, for being stirred up, it will make a secondary or third fire, whereas Scottish coal consumeth at once. For which cause all the brewers and artificers of London rather use this sort. Houbeit it is not so fit for some metallique purposes by reason of the more abundant heavy sulpherous substance remaining in it."

Turf and peat are then described; and *Brush fuel* is distinguished as "stubble, baueings, straw, "furs, fearne, ling, heath, with other stalkes of hearbes, weeds, and under shrubs."

Sea coal and pit coal.

While on the question of names, it may be as well to explain that the term *sea coal* is generally applied to the coal from Durham and Northumberland, but it is often used as a general term for all kinds of coal sent from a coalfield by sea, pit coal being used for such coal as is produced from inland collieries.

A.D. 1665.

In 1665, Lord Dudley published his Metallum Martis,§ from which we glean some facts of interest. Previously to that date it is evident that coal was used for many purposes, but evidently not to any considerable extent for the smelting of iron ore, or the manufacture of merchant iron.

A.D. 1619.

Dudley informs us that in 1619 he was taken from Baliol College, Oxford, "to look and manage "three ironworks of my father's; one furnace and two forges in the chase of Pensnet in Worcestershire." "Wood and charcoale growing then scant, and pit coles in great quantities abounding near the furnace," Dudley altered his furnace, and made some experiments on the use of coal. He tells us after "a "second blast and tryal" he made iron, and found "the quality to be good and profitable, but the "quantity did not exceed above three tons per week." From this date unto January 1664, Lord Dudley was surrounded by difficulties and dangers. Nothing was really effected in the use of coal

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* Jars' Voyages Métallurgiques, 1774.

† Metallica, or the Treatise of Metallica. "Briefly comprehending the Doctrine of diverse new Metallical Inventions, but "especially how to melt and worke all kind of Mettle Oares, Irons, and Steeles with Sea-coale, Pit-coale, Earth-coale, and Brush "Fewelle. Also a transcript of his Majesties Letters Patent of Priviledge granted unto Simon Sturteuant for the said metallicall "businesses for one and thirty years. Published in printe before the last day of Easter Terme, as the said Simon Sturteuant was "by His Highness inioyned." Imprinted at London by George Eld, cum privilegio, anno 1612, May 22.

‡ The attempts of Simon Sturtevant were failures, as we find, in the year following the publication of his patent, the following by John Rovenson:—A *Treatise of Metallica*, but not that which was published by Mr. Simon Stortevant upon his patent, which is now by order cancelled and made void, by reason of his standing outlawed at the time of the grant, and so still continuing, and his neglect and not performance of the workes. Whereupon priviledge, by patent, is granted by the King's more excellent Majesty to John Rovenson, Esqr., for the making of iron and other materials with sea cole, pit cole, &c., for one and thirty years, according to which patent, and direction within this treatise, composed by the same John Rovinson, is published in print before the end of Easter terme, viz., the 15th of May 1613, and containeth a brief explanation, demonstration, or discovery of the inuentions priviledged, and the means, instruments, engines, furnaces, and with the materials, things, and workes to be made by the said fewels. The charge of an iron worke with sea cole is set down in the latter end of this booke. London, printed for Thomas Thorp, 1613, cum Priuilegio.

§ Lord Dudley's Metallum Martis, or Iron made with Pit-coale, Sea-coale, &c., and with the same Fuell to Melt and Fine imperfect Mettels and Refine perfect Mettels. London. Printed by T. M. for the Author, 1665.

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for iron making, notwithstanding the numerous experiments which were made, and some partial successes obtained, until 1735, when Abraham Darby appears to have solved the problem with complete success at the Colebrook Dale Iron Works, Shropshire.

Iron making, A.D. 1630.

Dudley informs us, indeed, that he made much pit-coal iron at a furnace at Himley, probably about 1630, but that he was driven out of it by the charcoal iron masters, after which he "erected a "new large furnace on purpose, 27 foot square, all of stone, for his new invention, at a place called "Hasco Bridge, in the parish of Sedgley and county of Stafford.† The bellows of which furnace were "larger then ordinary bellows are, in which work we made seven tons of iron per week, the greatest "quantity of pit coal iron that ever yet was made in Great Britain." Dudley is reported to have sold his pig iron at 4*l.* per ton, and his bar iron at 12*l.*; charcoal pig iron being then 6*l.* or 7*l.* per ton, and charcoal bar iron varying from 15*l.* to 18*l.* a ton. A firm established near Bristol, in which Dudley was a partner, failed, and in 1657 Captain John Copley, the most enterprising of them, went to Ireland, "and all men now desisting from the inventions of making iron with pit cole and sea cole. The "author (Dud Dudley), Anno 1660, being 61 years of age," applied for a renewal of his patent, which was refused, and we hear no more of the man who certainly led the way towards our great successes in the manufacture of pig iron.

Dudley, A.D. 1660.

The only excuse we have for occupying so much space with notices of the attempt to smelt iron ores with coal is that we glean from such notices, incidentally, some ideas as to the quantities of coal raised from the pits then in existence; and that we can study the evidences of the steady increasing importance attached to coal as a fuel for manufacturing purposes. From Dud Dudley's works‡ we glean the following particulars, which have a more direct bearing on our subject: "There is at least within ten "miles of the castle of Dudley twelve or fourteen cole works * * * each of which works "get two thousand tun of cole yearly, some get three, four, or five thousand tuns of cole yearly." This would probably amount to 46,000 tons of coal.

Dudley coal works.

A.D. 1665.

"Many small coles do so abound of no use, and fit for no sale, that in getting of twenty thousand tun of pit cole one half near is small cole, not drawn out of the pits, but destroyed, left and lost;" Dudley, with great foresight, proposed that this small coal "might have made many thousand tons of iron, and also have preserued this island's wood and timber."

Exportation of coal, 1665.

On the exportation of coal, Dudley says, "Seeing there goeth out of England, Scotland, and Wales "many thousand tons annually of pit coles and sea coles to furnish France, and also the smiths thereof, "Spain, Portugal, and Flanders, and especially the smiths thereof, the Low Countries, and the smiths "thereof, besides the Hollanders carries great quantities of our coles into foreign parts, without "which those countries cannot subsist." Dudley prays that "the coles may not be transported."

Bar iron made with pit coal (1618).

Near the author's dwelling, called Green's Lodge, there are four forges, namely, Green's forge, Swin forge, Heath forge, and Cradley forge; which four forges have barred all or most part of their irons with pit cole ever since the author's invention (1618).

Inland coal trade 1800.

In the year 1800, a committee was appointed by parliament to inquire into the state of the inland coal trade.§

Mr. Alexander Rabey, iron merchant, says, "the present price of the Staffordshire (coal) at the pit "is 6*s.* per ton of 21 cwt., and 120 lbs. to the cwt.; inferior coals are sold at 3*s.* per ton; the small "coals for engines are from 1*s.* to 1*s.* 6*d.* per ton." Mr. Rabey does not give the quantity sent from Staffordshire; but he gives the following information on the price of coals, after the cost of conveyance has been added:—

"I compute the average distance of those collieries (the Dudley collieries) to Brentford 148 miles, the boatage ¾*d.* per ton per mile, 9*s.* 3*d.* boy and horse of back carriage included, would be about ½*d.* per ton per mile, is 6½*d.* more in all, about 1*l.* 1*s.* 5*d.* per ton. A London chaldron of the Newcastle coals will be about twenty-seven cwt.; he adds one third of the weight, and one third of the price on a London chaldron; therefore if Staffordshire coals to Brentford cost 1*l.* 8*s.* 7*d.* per chaldron, allowing 2*s.* 11*d.*, they would stand when imported to London about 33*s.* per chaldron."

SHROPSHIRE.

SHROPSHIRE COALFIELD.—Shropshire from a very early period appears to have yielded from its stores fuel for the use of man. Shropshire coal has been found in the ruins of Uriconium.‖ We do not find, however, any record of the earlier colliery workings in this county. The "Leeds Intelligencer" for Nov. 23, 1756, has the following notice:—

Uriconium.

Strike in 1756.

"On Monday last the bargemen and colliers from Brosely, Madslywood, and Bontale rose and did much mischief at Winlock. On Tuesday were joined by the colliers about Dawley and Oaken Gates, and came to Shiffnall about 700 in number." They were dispersed (Nov. 14th).

Another letter, from Wellington, Nov. 12th, speaks of the terror produced. There were corn riots, and much corn was destroyed by the colliers. That 700 colliers should turn out, shows the extent of the workings at that time. Considering the very imperfect methods of getting coal at this time, and the conditions of distress which the riots show, we may estimate the annual produce of Shropshire at this time as from 250,000 to 300,000 tons. At the end of the 18th century we learn from "*The History of Fossil Fuel*,"—"There are at this time on the south side of the Severn 25 fire engines, and on the north side 155 fire engines at the different coal and iron works. Thirty years ago there were not 20 in the same district. These works, Madely Wood, Coalbrookdale, and others, employ 6,000 hands. About 260,000 tons of coal is raised in the district." P. 340.

GLOUCESTERSHIRE and SOMERSETSHIRE

SOMERSETSHIRE AND GLOUCESTER.—From Plott's History of Staffordshire¶ we learn that coal works were in active operation in the country bordering on the *Mendip Hills*, and that explosions of fire-damp were very common. Mr. Beaumont worked several collieries, and the accidents occurring at some of his mines were described in the "*Philosophical Collection*."

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* See an excellent "*Sketch of the History of Iron*," in Metallurgy. The art of extracting metals from their ores, and adapting them to various purposes of manufacture. By John Percy, M.D., F.R.S., 1864.

† By the 21st of James 1st, (1624,) all monopolies were declared void. The iron masters sought to bring Dudley's patent under this Act, but they failed to do so. Then, after much struggling, "over long to relate," he commenced his works at Himley. Dudley obtained a new patent, dated 2nd May, anno 14, Caroli Primi (1639).

‡ Metallum Martis, p. 26.

§ Inland coal trade, Report of the Committee, 1800. Evidence on Staffordshire.

‖ Thomas Wright.

¶ Plott's Staffordshire, p. 136.

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In 1678 Henry Powle communicated to the Royal Society* "an account of the iron works in the Forest of Dean," in which he gives a very clear description of the processes then adopted. He has the following paragraph: "Several attempts have been made to bring in the use of *sea coal* in these "works instead of charcoal; the former being to be had at an easier rate, the latter not without great "expense; but hitherto they have proved ineffectual."

We find the following in a "Survey of Gloucestershire:"—

"Iron ore exists in abundance; but a small quantity is raised; the greater part used in the furnaces is brought from Lancashire. Charcoal is chiefly employed in making the best wrought iron; and coke made from the forest coal answers for cast iron, and that which is rolled into plates for turning. Much coal raised, but no estimates of production.

Coal (house) from forest pits	7*s.* per ton.
Smith's coal	5*s.* „
Lane coal	4*s.* „

Gloucester and neighbourhood principally supplied with coal from Shropshire and Staffordshire.

DEAN FOREST. *Forest of Dean.*—The first notion of the production of coal in the Forest of Dean appears to be supplied by the records of the justice seat held at Gloucester in 1282, where it is stated that *sea coal* was claimed by six of the ten bailiffs of the Forest of Dean.†

A.D. 1282. In the "Laws and Customs of the Miners in the Forest of Dean," in the 29th section, we find "*sea*
A.D. 1300. *coal mine*" and "*oare mine.*" These laws were compiled about the year 1300.

A.D. 1610. James I. granted to William Earl of Pembroke "liberty to dig for and take, within any part of the "forest or the precincts thereof, such and so much sea coal as should be necessary for carrying on the "iron works." Coal appears to have been exported at the time. It must be admitted that the evidence of this is of a negative character, since it depends on the fact that coal is not included amongst the productions "which no person or persons were to take or carry out of the said forest." Coal was included in the sale by Charles I. to Sir John Winter, who is described by Evelyn as being

A.D. 1668. interested in a project for "charring sea coal" for iron making. An Act was passed in 1668, confirming to all persons digging for coal in the Forest their lawful rights and privileges, as also to the crown the liberty to lease the coal mines for a period not exceeding thirty-one years.

A.D. 1668. The Order of the Court of Mine Law, March 18, 1668, fixed the following prices per dozen bushells of lime-coal:

	s.	*d.*
At the Lime Slad	3	0
„ Top of Little Doward	5	4
„ Buckstones	5	0
„ Monmouth	5	6
„ Wear over Wye	4	0
„ Coldwole	3	6
„ Lydbrook	3	0
„ Redbrook	4	4

A.D. 1674. The next order of the same court, 9th March 1674, provides that "the servants of the deputy constable shall always be served first at the pits."

A.D. 1678. On the 8th September 1678 it was determined at the Mine Law Court that "a barrel or three "Winchester bushells should be the constant measure for coal, and fourpence the smallest price "allowed to be taken for a barrel of fire coal."

A.D. 1680. The same court issued an order on the 27th April 1680, directing "that no fire cole, smith's cole, or "lyme cole, shall be delivered upon the banks of the Wye between Monmouth Bridge and Huntsame "Ferry for less than 8*s.* a dozen bushells for the two former sorts, and 4*s.* 6*d.* for lyme cole, or if "between Huntsame Ferry and Wilton Bridge for less than 3*s.* 6*d.* a dozen."

Coal to be weighed, 1701. Passing over several similar orders, we arrived at an order of the 10th March 1701, that "every miner shall keep a paire of scales at their several colepitts, to weigh their cole withall." That none should be sent away unweighed; that the price should be 5*s.* a ton to the inhabitants of the hundred of St. Briavel's, or less than 6*s.* a ton to foreigners.

A.D. 1741. An order dated 2d March 1741 forbids any coal to be sold in the city of Hereford under 13*s.* the

Prices fixed. ton, fixing a horse-load at 2½ cwt. for 6*d.* a bushell at the pit, one cwt. of fire coal for 4*d.* a bushel, three bushels of smiths' coal for 5*d.*, and lime coal for 1*d.* a bushel, or 21 cwt. of fire coal for 7*s.* 6*d.*, "waid and delivered" at Sydney Pile, or at Pyrton Pile, or at Gatcombe.

A.D. 1788. In the year 1788 "there were then in the Forest 121 coalpits (thirty-one of which were not actually in work), which pits produced 1,816 tons of coal per week." This would give the production of Dean Forest in 1788 at 94,432 tons.

At this time, "the coal works in the Forest supply with fuel the lower parts of Gloucestershire "beyond Severn, and some parts across the Severn about Berkeley, the greatest part of Herefordshire, "the town of Monmouth, and part of the county of Monmouth."‡

RADSTOCK. Waldegrave records. RADSTOCK.—"There are old records in the hands of the Waldegrave family which inform us that as "early as the times of Edward the IV. the lead mines of the Mendip Hills furnished employment "to 10,000 miners." Such are the remarks of two mining engineers, who have for many years managed the Waldegrave property. They add to this, "Judging from the known period at which it (coal mining) "had assumed a certain degree of importance in the district, we are inclined to think that, contemporaneously at all events with the lead mining period already referred to, coal was worked in the "vicinity, and that, in all probability, it has been carried on, with a greater or less degree of activity, "for at least four hundred years."§

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* Philosophical Transactions, vol. 12, p. 934, 1676–78.
† The Forest of Dean, an Historical and Descriptive Account. Nicholls, 1858.
‡ The Report of the Assistant Deputy Surveyor of the Forest of Dean. See "The Forest of Dean," by H. S Nicholls, M. A.
§ The Radstock portion of the Somersetshire coalfield. By G. C. Greenwell, F. G. S., and J. McMurtrie.

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The same authorities think that coal mining commenced at Paulton, Grayfield, Nettlebridge, and Vobster, and that the workings were all "open cast," since "shallow pits at short distance apart," and "rubbish heaps scattered about," are to be seen in the Vobster and Nettlebridge and Morewood valleys.

The "Old Pit" at Radstock was sunk "one hundred and one years ago" (1864), consequently this would be in 1763. Until the beginning of the present century, about 400 bushells at 20 tons a day were hauled from the pits; and there appears to have been somewhere about 20 pits. We may probably infer that not more than 400 tons a day were raised, or about 120,000 tons a year in all the district. A.D. 1763.

The coal brought into the Port of London between 1747 *and* 1765 *from the Somersetshire coalfield* was exceedingly small, as is shown by the following return.

Years.	Bristol.	Bridgewater.	Total Quantity.
	Tons.	Tons.	Tons.
1747	8	—	8
1755	—	10	10
1758	13	—	13
1765	24	—	24

MONMOUTHSHIRE, GLAMORGANSHIRE, &c.—Mr. Llewellin attempts to show that in the time of Henry VIII., iron works had been established at Aberdare and Merthyr Tydfil; the Sussex iron masters leaving that county in which the wood was being rapidly exhausted for the well-wooded region of Glamorganshire. Several charcoal furnaces are described, and a large quantity of interesting matter is collected; but as this relates exclusively to the use of wood we have no matter to extract from the paper. There is, however, an account given by John Ray, the naturalist, of the Sussex process of iron smelting, from which a paragraph or two may be extracted with advantage, as showing the quantity of fuel used in 1672 to make a ton of iron.* MONMOUTHSHIRE and SOUTH WALES. Henry VIII A.D. 1530. A.D. 1672.

"Every six days they call a *founday*, in which space they make eight tun of iron, if you divide the whole sum of iron made by the *foundays;* for at first they make less in a founday, at last, more.

"The hearth, by the force of the fire continually blown, grows wider and wider, so that at first it contains so much as will make *a sow* of six or seven hundred pounds weight, at last it will contain so much as will make *a sow* of two thousand pounds. The lesser pieces of one thousand pound or under they call *pigs.*

That iron-making was carried on as early as the 15th century is proved.

"We have it on good authority, says a local author, that in the year 1815 a vast heap of cinders were sold, and conveyed from this part, near Troedyrhiw, to Dowlais, having been purchased by the Dowlais Iron Company. When these were removed, the workmen found a strong iron plate, upon which the hammer block had stood, and on one side the date 1478 could be distinctly traced; but unfortunately the men had no idea that this piece of iron was more valuable than the rest, and so it was broken up and sent with the rest.† A.D. 1478.

"One hundred years after this date (*i.e.* 1578), a record exists of iron works erected opposite Duffryn Furnace. The ruins are still visible, but more like the ruins of a small lime-kiln than of iron works.† A.D. 1578

"In the days of Elizabeth iron furnaces were at work around Merthyr, but they all used wood."† About A.D. 1570.

"In 1765" we have authentic evidence that a furnace was built at Cyfarthfa. "This furnace is "now called No. 5, venerable with its antiquity of one hundred years."

A little later than this a local poet, John Thelwall, sings— About 1770 probably.

"Taff's remoter vale,
Late by the magic of Vulcanian ore
Grown populous."

"The coal measures in the district were first developed by Mr. John Guest in a very small way, and "more for the use of the farmers and villagers than for his furnace. The facts as given by us are "handed down in some of the respectable families of Vaynor. The farmers of that place were in the "habit of taking a sack of lime to Mr. Guest, and for one halfpenny they received a sack of coal in "exchange. The load, generally borne on a horse, consisted of three sacks." We are then told the farmers would travel to Brecon, and sometimes to Kington in Herefordshire, "and sell his black "diamonds for 10*d.* the sack."†

"Of twenty-four loads of coals (char-coals) they expect eight tun of sows. In every load of coals, which consists of eleven quarters, they put a load of mine which contains eighteen bushells."

This will be about 5 bushells of charcoal to one bushell of iron ore.

"The manner of working the iron at the forge or hammer" contains also some curious matter.

That iron of a high class had long been manufactured in Gloucestershire and in South Wales, appears to be proved by the fact, that the wire works at Tintern and at Whitebrook depended for the high character of their productions from their "using the best malleable iron in the kingdom." Sir J. Pettus speaks of those works "as being productive of great advantage, not only to the interests of the society (the Mineral and Battery Works), but also to the nation generally."‡

* ARCHÆOLOGIA CAMBRENSIS. No. XXXIV., 3rd series. Sussex Ironmasters in Glamorganshire, by W. Llewellin, F.S.A. Ray's English words not generally used, 1672.

† Merthyr Tydfil 1867. The History of Merthyr Tydvil, by Charles Wilkins.

‡ Fodinæ Regales, Sir John Pettus, 1670. Some account of the iron and wire works at Tintern, by William Llewellin, F.S.A. Archæologia Cambrensis: 3rd series, No. XXXVI.

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Up to the year 1792 the pits in the county of Monmouth were in a great measure shut up from general use.

The consumption of coal before this period was exceedingly small, and was confined to a few iron works in the neighbourhood.

Shipments, A.D. 1799.

Mr. Rabey* reports on the Swansea trade, "The coal trade of that town was last year, 1799, "upwards of 3,000 vessels,† beside which, there is a consumption in the copper trade on the spot "of from 1,500 to 2,000 tons per week; and there is likewise up that river a great abundance of culm "for the lime trade." He estimates the cost of coal to the consumer in London, carried either by sea or inland navigation, at 50*s.* per chaldron.

Severn canal.

It was thought Newport might supply by the Severn canal from 50,000 to 100,000 tons at from 55*s.* to 60*s.* the chaldron, free of duty.

A.D. 1755.

In 1755 Mr. Bacon obtained the lease for ninety years of a district of country near Merthyr Tydvil, eight miles in length and four miles in width, at the very low rate of 200*l.* per ann. It is understood that his right extended only to the iron and coal mines found on the estate, and that he had a very small portion of the soil or surface, on which he erected works for the smelting and forging of iron. Soon afterwards, about the year 1783, he granted leases of his remaining term in the following parcels:—Cyfartha works, the largest portion to Mr. Crawshay, and the remainder to Mr. Hill."‡

The following table, however, shows in a satisfactory manner the steady increase of the production of coal in South Wales.

Coals brought into the PORT OF LONDON from the SOUTH WALES COALFIELDS in each of the following Years.

From 1745 to 1765.

Years.	Milford.	Tenby and Haverfordwest.	Carmarthen.	Swansea and Neath.	Llanelly.	Cardigan.	Total Quantity.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1745	1,516	298	43	—	—	—	1,857
1746	1,308	319	9	—	—	—	1,636
1747	2,175	448	32	—	—	—	2,655
1748	1,864	50	21	—	—	—	1,935
1749	2,727	124	—	—	—	8	2,859
1750	2,439	116	—	38	—	3	2,596
1751	2,091	287	32	57	—	—	2,467
1753	1,753	1,101	—	119	—	—	2,973
1754	2,867	890	89	16	—	—	3,862
1755	2,517	—	124	186	—	—	2,827
1756	3,031	453	176	21	—	45	3,726
1757	2,862	570	224	17	637	—	4,310
1758	2,020	206	—	63	—	—	2,289
1759	1,777	151	11	11	—	—	1,950
1760	2,964	405	53	—	—	—	3,422
1761	2,636	117	—	21	—	—	2,774
1762	2,221	631	13	—	—	—	2,865
1763	3,840	369	191	—	—	—	4,400
1764	2,544	599	151	79	—	—	3,373
1765	3,122	807	119	45	—	—	4,003

* Evidence on Swansea, 1799. Report of Committee on the Inland Coal Trade, 1800.

† We suspect there is some exaggeration in this statement. Those 3,000 vessels would represent upwards of 1,000,000 tons of coal. The computation for this is founded on the following table. The quantities of coal imported into London, and the number of ships bringing the same, has been taken for the years named. It may be that the vessels carrying coal in 1799 were as much smaller than those of 1832 as those of 1832 are less in tonnage than the vessels of 1869.

Tonnage of Coal Ships in the Port of London.

	Tons.	
1832	326	Average of all cargoes.
1835	327	" "
1840	330	" "
1845	333	" "
1850	341	" "
1855	327	" "
1860	353	" "
	2,337	
Average tonnage	334 to 1860.	

	Tons.	
1861	366	Average of all cargoes.
1862	365	" "
1863	395	" "
1864	474	" "
1865	503	" "
1866	532	" "
1867	522	" "
1868	503	" "
1869	525	" "
	4,185	
Average tonnage	495	

‡ *Malkin's Walk through South Wales*, vol. 1, p. 278, 1755.

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NORTH WALES AND ANGLESEA.—There are very few notices of the early coal trade of these districts. We get the following short account of the Mostyn collieries from *Pennant*:* NORTH WALES.

Flintshire.—"The collieries of Mostyn and Bychton have been worked for a very considerable time, and in the last century (the 18th) supplied Dublin and the eastern side of Ireland with coals. They were discovered in the township of Mostyn as early as the time of Edward 1st, as appears by an extent of that place, in the 23rd year of his reign. They are at present in a low state, partly from the rise of the works at *Whitehaven*, but more from the loss of the channel of the Dee, which in the beginning of this century flowed so close to our shore that ships of two hundred tons lay under this parish, with their cables twisted round the trees. At present, vessels of sixty or seventy tons cannot approach nearer than two miles, the Dee now flowing under the opposite shore. Still we load a few vessels for Ireland, and some for North Wales. Much is also consumed by the neighbouring smelting-houses, and the inland parts of Denbighshire. The improvement of land by lime has of late occasioned a great consumption of coal by the farmer, and by the persons who burn it for sale." FLINTSHIRE. Edward 1st.

The Agricultural Survey of North Wales informs us that in 1794 in Anglesea coal was scarce, and that there was only one colliery at work, producing 10 tons per day, or about 3,000 tons a year, and sold at 16*s.* per ton at the pit's mouth.† A.D. 1794.

The only manufactures then carried on in the district were the Pary's Mountain Copper and Sulphur Works, now known as the Mona Smelting Works. The quantity of copper produced was large.

From the Agricultural Survey of Carnarvon we learn, "In this county 28*s.* per ton is the common price of coals." This coal would be either Flintshire coal, or coals brought to Carnarvon by sea from either Cumberland or South Wales.

We know that coal mines were worked by Sir Roger Mostyn, Kt., Lord of the manor, as Plott mentions accidents of firedamp. Mr. Roger Mostyn tells us, "This above-mentioned work is upon a cole of five yards in thickness, and had been begun upon about six or eight and thirty years ago." In the paper referred to, which describes an explosion of firedamp, there is no information respecting the production of coal at this time. But we learn something of the work being carried on by the following: "On this pit stood a horse engine of substantial timber and strong iron work, on which lay a trunk or barrel for winding the rope up and down of above a thousand pound weight." Consequently they must have drawn considerable quantities of coal.‡

A series of tables showing the quantities of coal sent to London have now been given, except those relating to Scotland. After 1765, the last given, we have not found any continuation of similar returns. Dr. Watson, however, in his Chemical Essays, gives the accompanying table. He says, "The following account may be relied on:§

"An Account of Coals imported into the Port of London in ten years, ending at Christmas 1779. Coal sent to London from 1770 to 1779.

Christmas.	Chalders.	Tons
1770	615,330	= 784,545
1771	694,003	= 884,853
1772	725,008	= 924,485
1773	624,781	= 796,595
1774	623,727	= 795,251
1775	672,786	= 857,802
1776	700,207	= 892,763
1777	697,435	= 884,229
1778	647,361	= 825,380
1779	587,895	= 750,041"

A Report to the House of Commons, July 1830, enables us to add the following returns to Dr. Watson's tables:—

	Chalders.	Tons.
1780	657,302	= 866,627
1790	742,937	= 923,671

A.D. 1780 to 1790.

Dr. Watson remarks:‖ "No accounts are kept at the Custom House, distinguishing the importation "from Newcastle, Sunderland, Blythe, Hartlepool, &c., or from the several ports of Scotland and "Wales, the Crown revenues not being affected thereby." He, however, learns, "from another "authority,¶ that in the same year there were imported from Newcastle and Sunderland alone "692,093¾ chalders. By comparing these numbers, we may observe how small a portion of the coal "consumed in London is brought from other quarters."

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* Tours in Wales, by Thomas Pennant, Esq., 1810, vol. 1, p. 23.
† Agricultural Survey of North Wales, 1794.
‡ Plott's Staffordshire, p. 136. Philosophical Transactions, March 31, 1677, vol. XII., p. 895.
§ Chemical Essays, by R. Watson, D.D., F.R.S., 3rd edition, 1784, vol. 2, p. 358.
‖ Annual Register, 1777, ch. 161.
¶ AUTHORITY.—Reasons why the Bill, intituled "A Bill for rendering more effectual an Act passed in the third year of His late Majesty, intituled 'An Act for the better regulation of the Coal Trade,' &c., &c., ought not to pass into a Law, 1788."

		Chaldrons.
George III., 6th Year, 1766.	Annual vend from the Tyne	353,000
1784.	" "	458,000
1785.	" "	-**449,000
1786.	" "	-**434,000
1787.	" "	480,000

** Two months of year lost by an attempt to exact a higher price, by laying up the laden ships in the Thames. In 1786 this attempt was repeated at the season of the year most favourable for the sale of coals.

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The additional evidence obtainable is of a fragmentary character, still, as it serves to show the progress of the coal trade in particular districts, it has its value.

Duty on coal in London, 1786 to 1790.

It appears from the Report of the Committee appointed to examine the state of the several accounts and other papers presented to the House of Commons in 1791, that the duties on coals in London and the outports raised the following sums, nett produce, annually:—

	£	s.	d.
In 1786	474,152	2	5
1787	524,666	18	9
1788	534,468	6	0
1789	551,919	16	1
1790	510,945	15	2½

The duties on coal in the port of London at this time were as follows:—

	Per chaldron. £	s.	d.	Per ton. £	s.	d.
By 8th Ann., ch. 4	0	3	0	0	2	0
9th Ann., ch. 6	0	2	0	0	1	4
9th Ann., ch. 22, for building churches	0	3	0	0	3	0
Impost in 1779 of 5 per cent	0	0	$4\frac{16}{20}$	0	0	$3\frac{16}{20}$
Impost in 1782 of 5 „	0	0	$4\frac{16}{20}$	0	0	$3\frac{16}{20}$
	0	8	$9\frac{12}{20}$	0	6	$11\frac{12}{20}$

Coastwise duties. 1779 and 1782.

The duties on coals carried Coastwise into the outports were,—

	Per chaldron. £	s.	d.	Per ton. £	s.	d.
By 8th Ann., ch. 4	0	3	0	0	2	0
9th Ann., ch. 6	0	2	0	0	1	4
Impost in 1779 of 5 per cent.	0	0	3	0	0	2
Impost in 1782 of 5 per cent.	0	0	3	0	0	2
	0	5	6	0	3	8

There are several reasons why it is useless to attempt to compute the quantities from those figures We are not enabled to separate the quantities imported into London from the quantities sent to the outports. We do not know whether the duties were paid on chaldrons or tons; probably on both. We must receive those figures therefore as showing how steadily, with a few natural oscillations, the trade in coal continued to increase. We are enabled from Scott's Epitome and other sources to complete the importation of the London imports to 1800.*

A.D. 1780 to 1800.

1780,	imported into	London	854,298 tons.
1785	„	„	936,164 „
1790	„	„	952,845 „
1795	„	„	1,131,893 „
1800	„	„	1,281,823 „

Scotland.

The Scotch Coalfields.—There exist materials from which a good account of the collieries of Scotland might be written, especially as to the modes of working adopted, and the condition of the people employed. We are restricted, however, to a mere sketch, hoping that this work will be written by Mr. A. Giekie, director of the Geological Survey of Scotland, to whom we are indebted for some of the following notes.

Amongst the earliest reliable accounts of the Scotch coalfield we find that in the twelfth century William de Vetereponte granted to the monks of Holyrood "totam decimam de carbonario meo de Carriden."† This is the name of a small brook flowing into the Firth of Forth, about three miles north of the ancient palace of Linlithgow. This was in the reign of William the Lion, during whose reign the monks of Newbattle worked coal on the margin of the Esk.

A.D. 1189.

In the cartulary of the abbey of Newbattle there is a grant by Sayer de Quinci, Earl of Winchester, allowing the monks to work coal. In the year 1189 the father of this nobleman made over to the abbey the grange of Preston, with certain rights of pasture, peat, and fuel. Earl Seyer added to this

A.D. 1212.

gift a *coal work*. This was at the beginning of the thirteenth century, certainly before the year 1212.‡

We have numerous records of iron mining and smelting at an early date in many parts of Scotland. Probably the earliest record in any way connected with mining in relation to the province of Moray is contained in a charter, or, more properly, in the "Bulla Urbani IV. Monasterio Vallis St. Andreæ de

A.D. 1263.

Pluscardyn, concessa A.D. 1263."† The cartulary of Holyrood records the tithe of iron and gold. And in 1124 and 1127 one seventh of the ore raised was brought to the king's works at Dunfermline; and before 1510 iron was paid as rent to the Earl of Sutherland and Monteith.§ But neither these particular charters, nor any of those which are to be found up to the beginning of the eighteenth century, bear on the production of coal, as wood-charcoal was probably the only fuel employed.

This is noted merely for the purpose of correcting an error sometimes committed. Coal is not unfrequently mentioned in connexion with those ironworks, and it has been assumed that "*pit coal*" was intended by the term, whereas a little care in examining the evidence would have proved that the coal was *wood-coal* or charcoal.

* An Fpitome of the Progress of the Trade in Coal to London since 1775 has been published by J. R. Scott, the Registrar of the Coal market for the corporation of London; for the coal trade of London.

† Chalmers' Caledonia, ii. 866.

‡ See Cart. Newbattle, No. 73. Chalmers' Caledonia, ii. 400. Innes Early Scottish History, p. 131.

§ Lord Lindsay's Lives of the Lindsays.

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In 1291 William de Obervil grants to the abbot and convent of Dunfermline the right of opening the *coal heugh* on his land of Pittencrieff. From all the accounts preserved there were evidently small workings on the outcrop of the coal seams,—being, in fact, mere quarries. A.D. 1291.

In the year 1322 Bruce granted to Henry Cissor the lands of Kilbaberton "et illud *carbonarium* infra baroniam de Travernent, quod vocatur Gawaynes-pot."* Chalmers states that from the age of Robert Bruce there is a series of charters granting collieries in East Lothian. David II. granted a charter of the north part of the barony of Inverkeithing, "with the cold-heughe and milne of Graggeford."† In this reign coal was used in the royal household. Eighty-four chalders of coal were purchased for the use of the Queen's retinue, costing twenty-six pounds.‡ We find a charge at this time of twenty-six shillings and eightpence for twenty chalders of coal, with the carriage of them to Parliament. A.D. 1322.

The "coalieries of Tranent" were evidently well known in 1407, since we find several grants relating to them. The Fife miners were also successful in working coal. Henry de Sancto Claro, Earl of Orkney, granted to John Forster of Corstorphine a wadset of twelve marks Scots out of the barony and collieries of Dysart in Fife; which grant was confirmed by Robert Duke of Albany, in 1406.§ A.D. 1407.

Chambers tells us the coal was exported from Scotland in the fifteenth century, but he gives no authority for the statement. Coal was, however, but little used, and only within a short distance of the collieries.

Hector Boece, writing in 1526, says—

"In Fiffe ar won black stanis, quilk has sa intollerable heit quhan thay are kendillit that they "resolve and meltis irne, and ar thairfore richt proffitable for operation of smithis. This kind of blak "stanis are won in na part of Albion bot Allanerlie, betwix Tay and Tyne."‖ A.D. 1531.

Five years after the publication of Boece's history (1531) a formal agreement was made between the convents of Newbattle and Dumfermline, regarding the working of their coal in the neighbourhood of Pinkie. This document was printed by the Bannatyne Club.

In Sir David Lindsay's "Satyre upon the Three Estatis," written in 1535, there occur several references to the collieries of East Lothian as places which would be familiar by name to a large number of his readers. James V., A.D. 1535.

The coal trade of Scotland had gradually risen to such importance that in 1563, the ninth Parliament of Mary, we find the following order that no coal are to be taken out of the country under pain of confiscation of ship and cargo:—"In consideration of the great multitude of coales continuallie caried "furth of this realme, not only be strangers, bot alswa be the lieges and inhabitants of the samyn, "quhilk is now becummin the common ballast of emptie shippes, and gives occasion of most exorbitant "dearth and scantness of fewall." This shows that coal must at this time have been raised in considerable quantities. Mary, A.D. 1563.

In the year 1579 the Scottish Parliament found it necessary to ratify and approve the previous prohibition, and offer a reward to the "reveiler and apprehender of the contravenors of the Acte." A.D. 1579.

Thirteen years afterwards the Parliament were still anxious to guard the interest of the collieries, and we find them passing an Act "for the better punishment of the wicked crime of setting fire in coal "benches, be sum ungodly persones, upon privat revenge and despite." A.D. 1592.

The export of coal continued in spite of legislation, and evidently increased, the Acts of Parliament notwithstanding. In the year 1597 the King and his estate were given to understand "that the great "burne coals are commonly transported forth of this realm be divers and sindry persons, &c." It was therefore enacted that "no grite burne coile (great burn coal, that is, coal in large pieces) should be "exported on any pretext," &c.; and the ships were to be confiscated, and the shippers kept in arrest during His Majesty's pleasure. In 1598 we find the coal of the Brora seam worked for the purpose of supplying fuel for the salt-pans erected on the eastern coast of Sutherland by Lady Jean Gordon. A.D. 1597 A.D. 1598.

Coal mining progressed. The workings, however, were carried on without much method, with very imperfect machinery, and altogether under difficulties; many of them arising from a want of thought, many from a desire to adhere to the traditional methods of mining, and more really from the very imperfect machinery known in those days.

In the spring of 1621 we find the Privy Council settling the price of each horse-load of coal, and determining that it should not exceed seven shillings Scots, or seven-pence sterling.¶ A.D. 1621.

We find the coal proprietors continue troubling the Privy Council in such a way as would lead to the conclusion that the collieries were not very profitable concerns, or that the proprietors were very grasping individuals. We have the Privy Council, upon the petition of the landowner, granting licences to export coal, and other advantages; which appear to have given them a close monopoly, and to have made the fortunes of many of them; but we cannot discover any records of the quantities of coal raised or exported in the 17th century.

The privilege of exporting coal without any excise duty was long enjoyed by the family of Halkit of Pitferrane, near Dunfermline. It was renewed by Queen Anne, and ratified by her Parliament in 1707. This family continued to possess it until 1788, when it was purchased from them by the Government for the sum of 40,000*l.*** Machinery had by this time been introduced into the Scotch mines; but gunpowder had not even yet been employed in working the coal. Anne A.D. 1707.

For more than 300 years coal appears to have been worked around the town and neighbourhood of Culross. In the year 1510 we learn from the cartulary of Cambuskenneth that those collieries were subject to a tithe rent. In the 17th century the mining operations here were so extensive, and the fact of their being worked under the sea was esteemed so wonderful, that they became famous all the country over. James VI. in 1617 visited this district, and descended the Culross Colliery, and as the James VI., 1617.

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* Chalmers, ii. 400.
† Robertson Index to the Charters, p. 47, 24.
‡ Chamberlain Accounts, p. 496. Tytler, vol. ii. 217.
§ Robertson, p. 163, 29.
‖ Bellenden's Boece. Edit. Edinburgh 1821, p. xxxvi.
¶ Chambers' Domestic Annals, vol. i. p. 519.
** Sinclair's Statistical Account of Scotland: Art. Dunfermline.

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Taylor, the water poet.

story goes,* was greatly terrified, fearing, as usual, treachery and assassination. This mine was sufficiently notorious to induce John Taylor, the water poet, to describe it particularly in one of his poems. In this he says, "They did dig forty feet down, right into and through a roche. At last they "found that which they expected, which was *sea-cole*. They, following the veine of the mine, did dig "forward still; so that in the space of eight and twenty or nine and twenty years they have digged "more then an English mile under the sea; that when men are at worke belowe, an hundred of the "greatest shippes in Britaine may saile over their heads."

Salt works at Culross.

According to Taylor's account 90 tons of salt were then made weekly at Culross, equal annually, at 40 bushels to the ton, to 180,000 bushels; a quantity, at one work only, equal to about three fourths of the whole quantity of salt now manufactured at the different salt-works on the Firth of Forth. Ninety tons of coal are stated in Lord Dundonald's letter to be required for making 360 bushels of salt, or 500 tons for the annual make. Large quantities of coal were said to have been sent to London from Culross in the years 21 and 22, while the Scots' army lay at Newcastle, and interrupted the trade of the river.

A.D. 1678.

In 1678 Sir Robert Cunningham displayed much enlightened enterprise on the coast of Ayrshire, by introducing a series of extensive improvements upon his colliery of Saltcoates. Notwithstanding a grant from the Crown, the enterprise of Sir Robert was not rewarded as it should have been, as we find him in 1700 selling a large portion of his estate.‡

A.D. 1690.

In 1690, in the Parliament of William and Mary, it was declared that the right of importing foreign commodities should belong only to the royal burghs, and that the corporations should enjoy the exporting of all commodities, except "corns, cattle, horses, sheep, metals, mineral *coals*, salt, lime, "and stone."

Steam engine introduced.

About this time Newcomen's steam engine was introduced in Scotland for pumping water from the mines. Much additional information will be found in Bald's View of the Coal Trade, and in the New Statistical Account of Scotland.

A.D. 1745.

From 1745 we obtain a more exact return of the quantities of coal sent to London from all the several districts producing coal in Scotland until 1765. This will be seen in the following table:—

The COALS brought into the PORT of LONDON from the SCOTCH COALFIELD in each of the following Years.

From a MS. Custom House Return, Feb. 13, 1865: Robert Weston, Collector; Robert Simpson, Comptroller.—*In Bell's Collection*, M.R.O.

Years.	Berwick.	Leith.	Alloa.	Aberdeen.	Borrowstoness.	Dunbar.	Kirkaldy.	Preston Pans.	Dundee.	Anstruther.	Montrose.	Perth.	Inverness.	Total Quantity.
A.D. 1745 to 1765.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1745	—	64	1,694	—	286	70	246	—	—	—	—	—	—	2,360
1746	—	215	2,280	—	—	101	277	87	71	—	—	—	—	3,031
1747	—	204	1,516	—	—	105	—	—	—	—	—	—	—	1,825
1748	—	79	2,526	—	—	27	242	—	—	—	—	—	—	2,874
1749	—	246	2,719	—	—	—	33	—	—	—	—	—	—	2,998
1750	15	180	2,916	—	76	32	234	—	—	—	—	—	—	3,403
1751	—	202	3,759	—	42	24	42		—	—	—	—	—	4,069
1753		8	2,699	—	638	—	52	40	—	—	—	—	—	3,437
1754	—	191	3,236	—	539	59	261	367	—	47	—	—	—	4,700
1755	—	104	3,442	—	1,161	25	208	79	—	—	—	—	—	5,019
1756	—	370	3,298	—	623	9	101	20	—	41	3	10	—	4,475
1757	—	251	2,048	—	1,649	33	87	38	—	—	14	—	—	4,120
1758	—	813	3,086	—	760	—	75	—	—	—	—	—	—	4,734
1759		97	1,583	—	1,237	176	346	39	—	—	—	—	—	3,478
1760	—	704	2,729	—	980	141	220	77	46	—	4	—	—	4,901
1761	—	517	1,693	—	271	70	76	156	11	—	—	—	—	2,694
1762	—	232	1,739	—	1,176	76	43	4	—	—	—	—	—	3,270
1763	—	305	2,198	—	966	391	—	85	—	—	—	—	—	3,945
1764	—	160	2,507	2	599	56	93	145	—	—	—	8	58	3,628
1765	—	756	1,896	—	3,186	46	191	303	—	—	—	—	—	6,378

Coal tax, A.D. 1793.

The coal tax in 1793 pressed most unequally, and a strong feeling was rising against it. From letters addressed to Pitt we quote the following:—

"It appears from the Custom House books that the amount of the duty received in Scotland for coals "brought coastways from January 5, 1790, to January 5, 1791, amounted to 10,287*l.* 2*s.* 7½*d.*; the "quantity of coals so carried 55,838 tons 18 cwt. Duty from January 5, 1791, to January 5, 1792, "10,371*l.* 8*s.* 10½*d.*; quantity of coals so carried, 56,571 tons 10 cwt.

"The duty on coals brought coastways from port to port in Great Britain

	£	s.	d.
is per chalder, Winchester measure 36 bushels - - -	0	5	6
Ditto into port of London - - - - - -	0	8	10
Coals exported to Ireland, per chalder - - - - -	0	1	2
To British plantations - - - - - - -	0	2	3"§

We learn that "four fifths of all the coals imported to the north of the duty-free district of Fort "and Tay are Newcastle or Sunderland coals. * * * The consumer, whether of English "or Scotch coals, pays at present prime cost, duty, and freight."

* Forsyth's Beauties of Scotland. Chambers' Domestic Annals of Scotland.

† Pennyles Pilgrimage; or, the Moneyless Perambulation of John Taylor, *alias* the King's Majesties Water Poet. How he travelled on foot from London to Edinborough in Scotland, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging.

‡ New Statistical Account of Scotland, Ayrshire: Art. Stevenson.

§ Letters addressed to the Right Honble. William Pitt, Chancellor of the Exchequer of Great Britain, pointing out the inequality, oppression, and impolicy of the TAXES ON COAL; and a substitute for these taxes on all coals consumed in England and Scotland; also a substitute of one shilling per chalder to the Duke of Richmond by King Charles II. London, 1793.

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It will be seen by a Table given in Appendix that the best Newcastle coal was sold in the Firth of Forth at 35*s.* 6*d.* per chaldron of 54 cwt., and the best Forth coals at 24*s.* 3*d.*; and that at Aberdeen the best Newcastle was 35*s.* 6*d.*, while the Forth coal was only 31*s.* the chaldron. Appendix, Table 23, p. 15.

Some idea of the state of the coal trade at this time may be formed from the following statement relative to the estate of Lord Dundonald at Culross:—

"Four distinct and separate winnings may be made on different seams of coal, and the colliery at each wining may be carried to as great extent as any one colliery on the Forth. There is one colliery working only to the extent of 12,000 Newcastle chaldrons annually, which from Christmas 1790 to Christmas 1791 cleared of nett profit 3,385*l.* at the then inferior price of coal."* A.D. 1791.

It is not a little curious to find it asserted that the extension of ironworks will ruin the coal mines.

"The following statement is necesary to enable the public to judge of the injury, in one point of light, done to the coal owners by the erection of ironworks. There are two blast furnaces at Muirkirk, two at Cleland, three at Carmile or Clyde ironworks, in all seven; of which there are five at present in blast. Each blast furnace, blown by a steam engine, consumes, including engine coals, workmen's coals, and coals for calcining the mine or ironstone, at least 9,000 tons of coa. annually; *inde*, five blast furnaces will consume 45,000 tons. And as on an average each collier in Scotland does not turn out above eight tons of coal weekly, it will require 112 colliers to work the above quantity of coal, exclusive of other colliers and miners employed to sink pits, drive mines, and work the ironstone and limestone for the furnace. For these purposes it cannot take less than 150 additional hands; so that five blast furnaces will require 262 colliers and miners, formerly employed in preparing collieries for work, or in working coals for the domestic consumption of the inhabitants of Scotland. This evil is only *beginning* to be felt; it being certain, from the present *high price* and great demand for cast-iron, as well as from the *peculiar advantages* attending *many* situations in Scotland, that twenty additional blast furnaces will be erected in Scotland within the space of ten years from present date, requiring a supply of 2,048 colliers and miners. Ironworks in Scotland.

"This supply of hands must either be drawn from the collieries now working coal for the consumption of the inhabitants of Scotland,—in which case coal will increase in price above any calculation now possible to be made;—

"Or, erectors of ironworks must be compelled to breed hands for their works, by being prohibited by Act of Parliament, by a bill to be brought in for the special purpose, from employing any colliers now employed at the collieries.

IRELAND.—The history of the coal trade of Ireland is a very modern one. The following extract is from a very curious book.† IRELAND.

"One coal mine hath been found out in Ireland a few years since, by mere hazard, and without having been sought for. The mine is in the province of Leinster, in the county of Carlow, seven miles from Idof, in the same hill where the iron mine was of *Mr. Christopher Wandsworth*, of whom hath been spoken above. In that iron mine, after that for a great while they had drawn iron oar out of it, and that by degrees they were gone deeper, at last in lieu of oar they met with sea coal, so as ever since all the people dwelling in those parts have used it for their firing, finding it very cheap; for the load of an Irish car, drawn by one garron, did stand them, besides the charges of bringing it, in ninepence only,—threepence to the digger, and sixpence to the owner. Coal in Carlow.

"There be coals enough in this mine for to furnish a whole country. Nevertheless there is no use made of them further than among the neighbouring inhabitants; because the mine being situated far from rivers, the transportation is too chargeable by land. These coals are very heavy, and burn with little flame, but lye like charcoal, and continue so for the space of seven or eight hours, casting a very great and violent heat. In the place where this mine standeth do lye little smith coals above the ground dispersed everywhere in great quantity, from whence the smiths dwelling in the parts round about did use to come and fetch them, even before the mine was discovered."

Ireland appears to have derived all the coal used in that country from the coalfields of Great Britain. In an essay on the trade of Ireland we find the following.‡ Coal imported.

"There are imported yearly from Great Britain, in English and Scotch ships, between sixty and seventy thousand tons of coals, according to the Custom House books, for which we pay in ready money about 50,000*l.*, which sum is immediately carried off in specie, and the ships return home empty; others, not without good reason, make the quantity of coals imported to be near a third part more. We are apt to complain of the colliers carrying off so much of our money, which we more sensibly feel in the loss of our silver; and yet it is our own fault that we lose so much by them, since it is in our own power to save near half of the expense by becoming our own carriers, or importing the coals in our own shipping, whereby we might gain the freight, and merchant's profit, and pay only 8*s.* per ton for all the cost abroad."

"We are supplied with coals from *Erwin Saltcoats*, and lately from *Aran*, in *Scotland*; from *Whitehaven*, *Workington*, *Parton*, and *Mosson*, in *England*; from *Flint*, *Swansey*, and other places in *Wales*."

The author then proposes that the city of Dublin should raise by mortgage of the city revenue 6,000*l.* or 7,000*l.*, "and therewith purchase yearly at the cheapest time about 10,000 tons of coals, and "lay them up in several parts of the city for the conveniency of the inhabitants, and oblige themselves "to sell them in the winter at 18*s.* a ton."

"All attempts for discovering mines of coal, and conveying them by water carriage to the places of consumption, ought to be encouraged. We hope the design of making a navigable communication between Dungannon and Newry may succeed, that thereby we may be furnished with coals of our own country for our own consumption." Newry.

* Description of the estate and abbey of Culross, particularly of the mineral and coal property; wherein is given an account of the coal workings at Culross since the year 1572, together with a description of the coal-mining field of the Firth of Forth; showing that the Firth coalowners cannot receive the smallest injury by a repeal of the duty on coals, whether on English or Scots coal, imported into or vended in Scotland, &c. &c. Printed at Edinburgh, 1793.

† A Natural History of Ireland: in three parts, by several hands, Dublin. Printed by and for George Grierson at the Two Bibles in Essex, &c. (1726.) The first part of this work was "Ireland's Natural History," by *Gerard Boote*, late Doctor of Physic to the state in Ireland. It appears, from a notice by his brother Arnold Boote, to have been written in 1645. It was first published by Samuel Hartlib, Esq., in 1652.

‡ Arthur Dobbs' Essay on the Trade of Ireland 1729.

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A.D. 1728.

The authority already quoted, writing in 1728, says: "We have of late discovered coal mines in "the counties of *Cork* and *Leitrim*, and in August last in the county of *Kilkenny*, within two miles of "*Leighlin* Bridge, and the river Barrow, with a descent all the way to it. These last coals may be "carried down the *Barrow* in lighters to *Ross* and *Waterford*, and there shipped off to *Dublin*, where, "considering the lastingness of the coal (which will make them better for the kitchen) they may be "had cheaper than coals from Whitehaven, or any other place abroad."

Imports of coal.

At this time a considerable trade existed between Cumberland, the Isle of Man, and Ireland; there was also some trade between Scotland and the North of Ireland. Arthur Dobbs informs us * that "6 years coals at 14*s.* per ton, 42,059*l.* 0*s.* 8*d.*," is an item in a "*Medium of Imports*," printed in "An Essay "on the Trade and Improvement of Ireland." This shows that at that period, within six years, Ireland received upwards of 60,000 tons of coal. In another place, the "imports from England" give coals 30,000*l.*, and "from Scotland and Isle of Man" coals 11,900*l.* The writer continues, "the importations "from *North Britain* and Isle of Man vary but little, consisting chiefly of coals and tobacco, for which "our demands are pretty constant and nearly equal." Such is a somewhat discursive sketch of the condition of the coal trade to the end of the last century.

IRON MANUFACTURE IN RELATION TO THE CONSUMPTION OF COAL.

Coal used in make of pig iron, 1740.

The history of our iron manufacture incidentally furnishes us with the means of estimating, although only approximately, the progress of coal-mining. We have already noticed the result of the experiments for making iron with coal. If we advance to 1740, when the returns assume more the appearance of being correct, we find a change setting in. The flourishing and extensive works of Dudley no longer existed,—the 300 blast furnaces, mentioned by him, were now diminished to 59, and their total annual produce to 17,350 tons, or not quite 300 tons from each furnace, as is further shown in the following table, distinguishing the number of furnaces in blast and the make of iron in each county in the year 1740:†

——	Number of Furnaces.	Tons.
Brecon	2	600
Glamorganshire	2	400
Carmarthenshire	1	100
Cheshire	3	1,700
Denbighshire	2	550
Gloucestershire	6	2,850
Herefordshire	3	1,350
Hampshire	1	200
Kent	4	400
Monmouthshire	2	900
Nottinghamshire	1	200
Salop	6	2,100
Worcestershire	2	700
Sussex	10	1,400
Warwickshire	2	700
Yorkshire	6	1,400
Total	59	17,350

The annual average of each furnace was therefore 294 tons, but we suspect some of these were still using charcoal. The Sussex furnaces were certainly doing so.

Make of pig iron in Yorkshire.

The following Returns, obtained from original documents, give the make of iron in Yorkshire at Bowling, Low Moor, and Shelf, for six or seven years.

Name.	Date.	Average annual make.	——
		Tons.	
Low Moor	1773	1761	
	1793	2196½	
	1794	2152½	
	1795	2573¾	
	1796	2177	
	1797	2658¾	
Shelf near Halifax	from 1795 to 1798	3442	Proprietors, Messrs. Aydon and Ellwell. These iron works were bought by the Low Moor Co.
Bowling	from 1795 to 1798	1798	
Rotherham	in 1797	3000 maximum.	

* Arthur Dobbs: An Essay on the Trade and Improvement of Ireland. Dublin, MDCCXXIX.

† History of the Iron Trade from the earliest records to the present period. By Harry Scrivenor (1854), 1740.

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Minutes exist of meetings of the principal iron masters of York and Derbyshire, at Sheffield, August 11th, 1799; at Barnsley, March 6th, 1800. Joseph Dawson* chairman. At a meeting held in Wakefield in 1797, we find eleven ironmasters were present,† representing as many ironworks. Mr. Rose wrote to Mr. Hardy of Low Moor, in November 1797, that the iron made in Yorkshire was supposed to be about 200,000 tons; and Mr. John Hustler of Bradford writes to Mr. Dawson of Low Moor, about the end of the last century, that the counties of York and Lancashire consume about 1,500,000 tons of coal, and that the consumption of England, exclusive of London, was three times that amount, or four million and a half.

Meetings of iron masters, 1797.

Many of these were charcoal furnaces, but one by one they died out. In some districts the wood was exhausted; in others, the iron master was prohibited from using it; and in others the use of charred coal (coke), by reducing the price of pig iron, compelled the charcoal iron maker to abandon or to alter his mode of manufacture. The following tables show the actual condition of things in 1788.

Charcoal iron, 1788.

CHARCOAL PIG IRON.

——	Number of Furnaces.	Tons of each.	Total in each County.
Gloucestershire	4	650	2,600
Monmouthshire	3	700	2,100
Glamorganshire	3	600	1,800
Carmarthenshire	1	400	400
Merionethshire	1	400	400
Shropshire	3	600	1,800
Derbyshire	1	300	300
Yorkshire	1	600	600
Westmoreland	1	400	400
Cumberland	1	300	300
Lancashire	3	700	2,100
Sussex	2	150	300
Total	24	—	13,100

Average produce from each furnace 545 tons.

Coke pig iron, 1788.

COKE PIG IRON.

——	Number of Furnaces.	Make of each.	Total in each County.
Shropshire	21	1,100	23,100
Staffordshire	6	750	4,500
Derbyshire	7	600	4,200
Yorkshire	6	750	4,500
Cumberland	1	700	700
Cheshire	1	600	600
Glamorganshire	6	1,100	6,600
Staffordshire	3	800	1,600
Total	53	—	48,200

Average produce of each furnace 909 tons.

Total of *charcoal* pig iron	13,100
Do. of *coke* pig iron	48,200
Or in England and Wales, pig iron	61,300

At this time there were erected in the Western Highlands two charcoal furnaces, one at Goatfield and one at Bunawe (this furnace is still in existence, belonging to Harrison, Ainslie, & Co., of Ulver-

* Joseph Dawson was the founder of the Low Moor Iron Works.

† At a Meeting held November 13th, 1797, at the White Hart Inn, Wakefield, to petition against Mr. Pitt's proposed tax on iron at the furnace.

Present:
Mr. Walker, Rotherham Furnaces.
„ Cockshutt, Huthwaith.
„ Sales, Brightside Iron Works.
„ Cook, Kilnhurst Forge.
„ Chambers, Shelf Furnaces.
„ Firth, Sheffield.
„ Sturges, Bowling.
„ D. Hardy, Low Moor.
„ Darwin, Elsecar.
„ Becroft, Kirkstall.
„ Emmett, Birkenshaw.

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Carron iron works.

stone), producing 700 tons per annum each. There were also at this time at Carron four furnaces making pig iron with coke, and two furnaces at Wilsontown and Cleugh. At these furnaces 5,600 tons of coke pig iron were made, and 1,400 tons of charcoal iron at those first named. This will make the total produce of pig iron by the use of coke:—

England and Wales - - - - - -	48,200 tons.
Scotland - - - - - - -	5,600
	53,800

This will have required not less than 376,000 tons of coal, probably 400,000 tons.

David Mushet, 1788.

There were at this time (1788) 60 melting refineries for working with coke, making not less than 15,600 tons, using above 100,000 tons of coal; therefore, at least 500,000 tons of coal were coked and used. The authority quoted says, that "from this time, 1788, the quantity of iron made began to "double itself every eight or 10 years, having in 1796, by the excise returns, amounted to 167,321 "tons." This quantity would for all purposes have required nearly a million tons of coal for its production. Reflecting upon this rapid increase, Mr. Mushet writes:*

1796.

"Were it necessary to excite attention to a subject so interesting in a national point of view, I might "state, by way of contrast to the former yearly make of 17,350 tons (1740), that there are manufactured now nearly half a million tons of pig iron, in the various manipulations attending which at "least 5,000,000 of tons of pit coal are consumed." This is probably somewhat in excess of the true quantity.

Plott on coal and ironstone, 1886.

Plott's History of Staffordshire affords but a small amount of information respecting the quantity of coal produced. The date of publication is 1686; it would therefore have been satisfactory to have found from so good an observer some account of the coal produce of those days. He tells us that around Wednesbury, Dudley, and Sedgley "more commonly there are 12 or 14 colerys at work, and "twice as many out of work, within 10 miles round, some of which afford 2,000 tuns of coal yearly; "others three, four, or five thousand tuns, the upper or topmost beds above the ironstone lying sometimes ten, eleven, and twelve yards thick; nay, I was told by Mr. Persehouse of Nether Gournall "that in his grounds at *Etingsale*, in the parish of Sedgley, in a place called *Moorefields*, the bed of "coal lyes 14 yards thick, in so much that some acres of ground have been sold hereabouts for a 100 "pound per acre. I was informed of one acre sold for 150 pound; and well it might be so, since out "of one single shaft there have sometimes been drawn 500 pounds worth of coal. Nor, indeed, could "the country well subsist without such vast supplies, the wood being most of it spent upon the iron-"works; for *it is here thought not only fit for the kitchen, but all other offices, even to the parlour and "bedroom.*" Leland notes of Wednesbury, "Se coles there," and "At Walleshall be pittes of se cole, "pittes of lyme, that serve also Southtown, four miles off. There is also yren owre." From this it is evident that coal for all domestic uses was coming into general request.†

The making of Coke.

Plott informs us that coal was used in the glass houses, salt works, for brick making, a clump of 16,000 bricks requiring "about seven tunns of coal," and "for maulting." He continues:—"They have "a way of *charing* it (if I may so speak without a *solecisme*) in all particulars the same as they do "wood, whence coal is freed from these noxious steams that would otherwise give *mault* an ill odour. "The coal thus prepared they call *coaks*, which conceives as strong a heat almost as charcoal "itself."‡

Talke, 1674-5.

At Talke, Cambden informs us, "Mr. Thomas Pool, in a little piece of land in this parish left him "by his father (who had twenty years before dug for a coal mine with no success), found one, which "in the years 1674 and 1675 yielded him 800*l.* clear profit."

In the Philosophical Transactions for 1712 there is a paper by Mr. Fettiplace Bellers, F.R.S., giving a section of the strata near Dudley. This only shows that the collieries were well opened out.

Shropshire.—In 1746 the Rev. Mr. Mason, Woodwardian Professor at Cambridge, writes:—

"Several attempts have been made to run iron ore with pit coal. I imagine it hath not succeeded anywhere, because we have had no account of its being practised; but I find that Mr. Ford, from iron ore and coal, both got in the same dale, makes iron brittle or tough, as he pleases; there being cannon thus cast so soft as to bear turning like wrought iron."

Mushet, writing in 1840, express his belief that Dudley's statement in the "Metallum Martis" was highly exaggerated. Dudley states that not less than 300 blast furnaces were smelting iron ore with charcoal. Mushet writes:—

"From a paper in my possession, supposed to have been framed about the time of the South Sea "Bubble * * * (previously to the use of pit coal) * * *, we find the 300 "charcoal blast furnaces of Dudley diminished to 59, yielding upon an average about 294 tons of pig "iron a year each," the total quantity of pig iron made yearly being 17,350 tons. Mushet also informs us, that there were 100 forges at this time, which made about 12,060 of malleable iron, "being ¾ of a "ton less per week to each forge than was assigned by Mr. Dudley about 100 years before."

Blast furnaces of Dudley, 1620.

Dud Dudley appears to have made good pig iron from pit coal about 1620. Then "the process fell "asleep, and was not recovered with any success until about the year 1740, a lapse of 120 years.

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* David Mushet, "On the first production and use of cast iron," 1840, p. 391.

† The Natural History of Staffordshire. By Robert Plott, LL.D., Keeper of the Ashmolean Museum, and Professor of Chemistry in the University of Oxford. Anno MDCLXXXVI. Quoted by Cambden, Magna Britannia, vol. V., Staffordshire, p. 26. Again Cambden quotes this from Plott, ibid., p. 45. Leland, VII., p. 39.

‡ Cambden, Magna Britannia, vol. V., p. 91. A description of the several strata of earth, stone, coal, &c. found in a coal pit at the west end of Dudley, in Staffordshire, by Mr. Fettiplace Bellers, F.R.S. To which is added a table of the specific gravity of each stratum. By Mr. F. Haukshee, F.R.S., communicated by Dr. Hans Sloane, R.S. Secr., vol. XXVII., p. 541. "A letter from the Rev. Mr. Mason, Woodwardian Professor at Cambridge, and F.R.S., to the Pr. R.S., concerning spelter melting iron with pit coal, and a turning well at Broseley."—Phil. Trans., vol. XLIV., p. 2, p. 379. Papers on Iron and Steel, practical and experimental. A series of original communications made to the Philosophical Magazine, chiefly on those subjects. By David Mushet, 1840. David Mushet, "Papers on Iron, 1840, p. 43."

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"From this period until the year 1788 I have not found any statement of the annual production of "pig and bar iron in Britain."

We have, however, given to us by the same author, some tables showing the relative values of charcoal and coke in iron making; and from these we can readily make our calculations.

Coke.

Coke pig iron.

1 ton of	2,240 lbs.	clod coa. *coke*	produces	1,040	lbs of pig iron.
1 „	„	splint coal *coke*	„	840	„
1 „	„	mixed coals coked	„	702	„

Wood Charcoal.

Charcoal pig iron.

1 ton of 2,240 lbs. produces 2,072 lbs. pig iron.

The reducing power of charcoal being considerably greater than that of the best coke.

1 ton of	2,240 lbs.	of carbonated	pig iron	requires	coke of clod coal	4,824 lbs.	6.
1 ton	„	„	„	„	of splint coal	5,973	3.
1 ton	„	„	„	„	of mixed	7,147	5.
1 ton	„	„	„	„	of wood charcoal	2,422.	

According to this, when Mr. David Mushet wrote, nearly four tons of coke were required for the production of a ton of pig iron. "Five tons of coal to a ton of pig iron was the case 30 years ago (*i.e.* in 1810) in Staffordshire."* A.D. 1810.

The following remarks on the relative positions of wood and coal are so much to the point of our inquiry, that we quote the passage:—

Wood and coal used for iron

"A charcoal blast furnace which smelts the whole year round, and occasionally makes forge pigs and carbonated iron to the amount of 1,000 tons annually, will consume 16,000 sacks of charcoal, which may be estimated at 1½ cwt per sack, or 1,200 tons, or 2,688,000 lbs. This, divided by 18·75 lbs., the pounds in a cubic foot, gives for the quantity of timber, in cubical feet, 143,360. In the present state of the woods which are attached to ironworks, one acre will not yield more than 1,200 cubical feet of timber. To ensure the annual quantity, $\frac{143360}{1200}$, nearly 120 acres of land would require every year to be cleared, or at 18 years' growth 1,400 acres would be requisite to form with care an unfailing source of supply, and at the rate of 4*l.* per ton the fuel would cost 4,800*l.* Let this be compared with a blast furnace manufacturing the same quantity and quality of coke pig iron. The average quantity will be nearly six tons of splint coal, or, as they lose 50 per cent., in charring three tons of coke, × 1,000 tons of pigs = 3,000 tons of coke, which at the highest price stated, 11*s.* the ton, amounts to 1,650*l.*, or less than the charcoal 1,150*l.*"

In 1796 Mr. Pitt proposed, as we have already stated, to lay a tax upon coals, to be paid without exception at the pit's mouth. Dr. M'Nab was appointed chairman of a committee to resist the tax, and to watch over the interest of the iron masters. A Committee of the House of Commons was appointed, facts were collected, and witnesses examined. The measure was, however, finally abandoned. The following table arose out of that inquiry:—

Make of pig iron, 1796.

Counties in England and Wales.	Number of Furnaces.	Excise Returns of Pig Iron made.
		Tons.
Cheshire - -	2	4,710
Cumberland - -	4	5,144
Derbyshire - -	3	2,138
Herefordshire - -	5	2,850
Gloucestershire - -	2	380
Yorkshire - -	22	21,984
Shropshire - - -	23	68,129
Wales, N. and S. -	28	45,994
Staffordshire - - -	14	15,820
Sussex - - -	1	172¾
Total -	104	167,321¾

Mr. David Mushet gives, in connexion with this table, "supposed quantity by the trade," as 133,950 tons, and "actual returns" 108,793 tons. Since there is no information given as to the way in which the information was gained, we feel compelled to adhere to the excise return.

Blast furnaces in Scotland.

Scotland returned this year 17 furnaces as producing 16,086 tons, making a total annual produce of 183,407¾ tons. Eight years previously there were 24 charcoal furnaces in blast. We are not enabled to determine accurately the number of charcoal furnaces in blast in 1796; but we are disposed, from a careful examination of all the information we can obtain, to believe they had been reduced to ten. If this was the case, there were 94 furnaces using coal, and producing not less than 157,000 tons of pig iron. According to the returns given this would require an average consumption of nearly three tons

* On the progress of the manufacture of iron with pit coal. David Mushet, Paper on Iron and Steel, pp. 407–8.

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of coke to the ton of iron, or not less than 785,000 tons of coal would be consumed in the blast furnace. In the six years following, Mr. D. Mushet says furnaces were either built or building—

England and Wales - - -	40
Scotland - - - -	7
	47

The produce when these were completed, about 1800 or 1802, would be considerably increased.

Pig iron, 1788 to 1800.

The following is an approximate summary of the pig iron manufacture at the end of the last century:—

		Tons.		Tons.		Tons.
1788.	Pig iron made -	53,800	Coke used -	376,000 = to coal -		752,000
1796.	„ -	157,000	„ -	785,000 = „ -		1,500,000
1800–2.	„ -	170,000	„ -	850,000 = „ -		1,700,000

Appendix No. 24, p. 15.

We find from a return given by Farey in 1806 that there were in Derbyshire 12 furnaces in blast, making 10,329 tons of pig iron. Most of those give the erection of the works of 1786 and 1799.

From the years 1788 to 1800 not less than 16,500,000 tons of coal will have been consumed in the manufacture of pig iron in the blast furnaces of the United Kingdom; and in the manufacture of this pig iron into bar or merchant iron a similar quantity of coal will have been consumed. We may therefore fairly estimate that thirty millions of tons of coal were burnt in this industry alone within the last twelve years of the eighteenth century.

An *estimate* of the quantity of coal produced from 1660 to 1780.

The Durham and Northumberland coalfield for a long period appears,—as nearly as we can make out from the imperfect returns which exist,—to have produced about a quarter of the coal yielded by the United Kingdom.

In 1778 the vends of the northern ports were considerably less than two million tons. Therefore, regarding the above proportion as being nearly correct, the production of this island at that time would not advance to 7,000,000 tons.

With a full appreciation of the uncertainty of this kind of computation, we may venture to estimate the production of the kingdom in the earlier years of the last century as follows:

Years.	Vends of Northern Ports.	Estimated Produce of Kingdom.
	Tons.	Tons.
1660	537,000	2,148,000
1700	653,000	2,612,000
1750	1,193,457	4,773,828
1770	1,551,350	6,205,400
1780	1,606,244	6,424,976

The constancy of the proportion existing between the coal imported into London, and the vends of the northern ports for the years given, enables us, without much fear of error, to compute the quantities for other years, of which we cannot discover a return. Thus we obtain the following quantities as an approximation to the coal produced in the United Kingdom in the years given:

1785 - - - - -	6,888,712 tons.
1790 - - - - -	7,618,760 „
1795 - - - - -	10,681,728 „
1800 - - - - -	10,080,300 „

If we carry our computation still further, accepting the data which we have given as being fairly reliable, it will be seen that from the time of Charles II. to the first year of the present century we produced, used, and exported not less than 700 millions of tons of coal. The quantity of coal worked before the middle of the 17th century cannot now be ascertained; it can scarcely be guessed at. But from a careful study of all the evidence which has been given, and some collateral evidence, which has not been thought of sufficient value for publication, we are disposed to believe that between 1500 and 1660 the mean annual productions of all the coalfields of the kingdom could not have been less than 1,000,000 tons. Accepting this computation, and believing that if it errs, the error is not in excess, this country will have produced in the three centuries before 1800 not less than 850,000,000 tons of coal.

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CHAPTER III.—PRODUCTION OF COAL FROM 1800 TO 1850.

Canal construction.

DURING the last half of the eighteenth century we have an example of the rapid extension of the means of internal communication. The period when canal construction was the greatest was between 1755 and 1800, as we have shown in the list of canals in the Appendix, and this naturally led to a considerable extension of our coal trade, and to increased activity in British manufacture in general.

Appendix, No. 22, p. 14.

"The effect of opening lines of inland navigation, when formed upon proper scientific principles, and executed with due economy, has been, on the concurrence of all testimony, the extension of improved agriculture, the equalization of prices of fuel and provisions in different districts, the diminishing the danger of scarcity in both of these necessaries of life, and advancing the general improvement of the condition of the people, by the creation of a new, vigorous, and continued demand for labour."*

That England should have waited so long before she began those works which, when once begun, she carried forward with energy, is not a little curious, as exhibiting that *inertia* which appears to be a marked characteristic of the Celtic mind, even when the stream of the race has diverged from the main line, and become mixed with the flow from other sources.† With strong conservative tendencies, the race clings to the groove in which its forefathers moved, until the mind can no longer blind itself to the necessity of leaving it. This conviction having once gained possession of the mind, the Englishman begins to move with energy, and rapidly acquires a momentum which carries him onward through all difficulties, and enables him to succeed in whatsoever he undertakes. This peculiarity was especially shown in relation to canals.

Sankey Brook, 1755.

Up to 1755, when a canal from Sankey Brook to St. Helen's, about 11 miles in length, was began, little had been done beyond maintaining in a satisfactory condition our navigable rivers. We have shown in the table referred to how rapidly between 1755 and 1780 the construction of canals was proceeded with, and we have constructed another table showing that between 1800 and 1827 forty-four canals or improvements of rivers had been projected, received the Royal Assent, and were mainly constructed. The result of these improvements in inland navigation was soon seen in the increased distribution of the coal from the inland counties over those parts of the kingdom which were remote from the coalfields.

Appendix, No. 22, p. 14.

Appendix, No. 25, p. 16.

We have diligently sought for returns of the quantities of coal carried from the coalfields by the canals when they were first constructed. There has been but little information preserved upon which any reliance can be placed. We have been furnished with the quantities of coal passing along the Erewash canal, which was constructed about 1778, commencing in the river Trent, and joining the Cromford canal near Langley Bridge. This canal was designed and executed chiefly by the owners of the extensive collieries situated on its line and at its northern extremity. The following statement suffices to show the rate of increase in the traffic of coal on this canal. The annual statement, until the railway in connexion with it was constructed, appears in the Appendix:

Erewash Valley Canal, A.D. 1778.

See Appendix, Nos. 90 and 91, pp. 91 and 92.

Appendix, No. 26, p. 16.

1803	254,268 tons.
1813	301,345 „
1823	319,873 „
1833	316,187 „
1843	330,869 „
1848	427,670 „

The local land sales are not included in these quantities; nor are the quantities of coal used in the district for iron making purposes given. It is not easy to estimate either of those with such information as is preserved. In 1849 the railway was opened, and the sudden extension of the Derbyshire and Nottinghamshire coal trade became at once apparent, as will be shown in a future page. The extent of the coal workings in Derbyshire and the immediately adjoining counties about this period will be seen by referring to the lists of pits given in the Appendix. As the number of collieries now given (1869) in the inspection district of Mr. Thomas Evans, which embraces Derbyshire, Nottinghamshire, Warwickshire, and Leicestershire, amounts to 192, and as the numbers given in one (Farey's) list amounts to 283, and in the other (Glover's) to 242, it must be explained that the name of each pit is given in those lists, but in the later one the name of the colliery only, which may embrace several pits, and the lists extend to some collieries in Yorkshire, Lancashire, Cheshire, and Staffordshire. From these we have no actual return of coal raised, but we are enabled to found some conclusions, upon the information given in those lists, in connexion with other returns, which enable us to arrive at the conclusions which are to follow.

Appendix, No. 20, p. 8.

Appendix, No. 27, p. 27.

The lists of all the collieries in the United Kingdom occupy the Appendix from p. 17 to p. 55

DERBYSHIRE produced, according to Farey, in 1808, for the twelve months ending June:—

Derbyshire, A.D. 1808.

Hard coals	205,006 tons.
Soft „	37,289 „
Cobbles „	27,161 „
	269,456 „

Lyson gives the same return, adding that they were "exported by the Cromford, Derby, and Erewash canal and Trent navigation." Farey gives the value of the above coal and of 24,834 quarters of "cokes" at 122,838*l.*, which may be computed as representing about 14,000 tons of coal.‡

Lyson Britania.

* Report of the Select Committee on the state of the poor in Ireland, 1830.

† As an incentive towards the improvement of our inland navigation, we had the examples of Rome in our own islands; the Caerdike, forming a communication between the rivers Nene, near Peterborough, and the Witham, three miles below Lincoln, being constructed by the Romans. France made canals in the reign of Henry 4th. The French constructed the canal of Languedoc in 1661. Russia has long availed herself of this mode for facilitating inland traffic, and this people had already constructed canals for no less a distance than 4,472 miles in the reign of the Czar Peter.

Canals, Roman, Francis 1st., A.D. 1661.

‡ Farey's Derbyshire.

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From some early reports of the Leeds and Liverpool Canal Company we are enabled to give the following account of the coal traffic of the west riding of Yorkshire and of Lancashire:—

Lancashire and Yorkshire coal, 1803 to 1834.

Coal carried by the Leeds and Liverpool Canal.

Date.	From Yorkshire.	From Lancashire.	From Tarleton.
	Tons.*	Tons.	Tons.
1803–1804	58,127	160,838	44,541
1813–1814	106,314	201,897	49,217
1823–1824	100,807	212,457	35,305
1834	100,726	282,854	35,150

* The ton used by the Leeds and Liverpool Canal and Douglas Navigation was 22 cwt. by Act of Parliament.

This canal was opened from Burnley to Enfield in 1801, from Enfield to Blackburn in 1807, from Blackburn to Liverpool in June 1810. The quantity sent from Tarleton was either sent to Liverpool for shipment (the Douglas navigation), or to Preston by the river Ribble.†

Derbyshire coal.

The following statement by Farey‡ shows how difficult it must have been at the beginning of this century to obtain a knowledge of the weight of coal raised:—

Land-sale.

Derbyshire measures.

Coals were often sold at the pits, to the inhabitants who sent their teams, called the *land-sale*, by so much per corse, or box in which they are drawn, instead of being weighed; but more commonly a certain number of corves were supposed to make a ton, and by that denomination they were sold. In many instances the coals were laid in separate heaps, on the pit-hill, of a ton or ton and half, &c., according to the usual loads of their customers. In most large works they had weighing engines erected to weigh the tram-corves as they were drawn, or to weigh loaded carts and waggons; and where such were not provided, it was not unusual to determine the weight by the tollman's account at the nearest turnpike weighing engine.

Coal stacks.

At Tibshelf and other places the coals were stacked on the hill, in what are called three-quarter stacks; these at Tibshelf Farey found to be six feet long, 3½ feet wide, and five feet high, which gives very nearly 105 cubic feet; these are said to weigh at the engine, when fresh drawn, 44 cwt. (of 120 lbs.), and when dry, 41 cwt., which is 47 to 44 cwt., of 112 lbs., very near. The three-quarter stack was sold here at 10*s.* (in November 1808), the buyer loading himself. At that time the working colliers were paid 3*s.* 9*d.* per three-quarter stack for getting, punching, &c.

Transport of coal

In connexion with the transport of coal by canal about this period, the following clear statements, also by Farey, are of great importance:—

Midland coal sent by canal.

Derbyshire ton.

"Vast quantities of coals are annually sent out of the counties of Derby§ and Nottingham southward, by means of the Cromford, Derby, Erewash, Grantham, Leicester, Melton-Mowbray, Nottingham, Nutbrook, and Trent canals or navigations, and others with which these connect. The ton has been the usual denomination by which these coals are sold to the boatmen and dealers; but previous to 1798 the quantity or weight allowed to a ton varied at almost every coal wharf or place of loading the coals brought down by railway branches of the Cromford, Erewash, Nottingham, and Nutbrook canals from the different collieries in their vicinities, by which uncertainty of the weights, frauds and frequent disputes were produced, and the navigation companies were much inconvenienced in collecting their tonnage duties on the passage of these coals along their respective canals and navigations. These produced, in the above year, meetings of the principal coal masters of the above district, and of the committees of the above nine navigation companies; and after some discussion it was agreed to put an end to all diversities of weights carried on these canals, by the erection of a sufficient number of weighing-houses upon them, and of so modifying their several sets of byelaws relating to tonnage, that every boat used on them should previously be numbered, described, and gauged in the most minute and accurate manner at their joint expense, and the particulars printed for the general use of their toll clerks, and of the traders and coal masters; and the latter agreed, instead of ascertaining the weights of coals sent off from their respective wharfs, and there keeping accounts, as had before been done, to appoint a sufficient number of general clerks at the canal weighing-houses above mentioned, who should not only ascertain, by the depth of loading and printed tables above mentioned, the quantity of coals on board every boat which passed, but that they should also calculate their value, and take the money for them from the boatmen, according to the price per ton, of 120 lbs., fixed by each individual coal master on his coals at the previous stated meeting of the coal masters, placing the same to the proper account of such coal master in a set of books kept by such general clerks, who should account and pay over such moneys to the coal owners at short stated periods; by which means the giving of different weights or lengths of credit would be done away, and the prices and quantities from each colliery (except their land sales) would be known to all the other coal masters.

"Thos. Walker, Esq., of Bilborough, Notts., was selected by the Canal Committee and other coal masters to digest and carry into effect the building of the necessary weighing-houses and offices, and contriving the most exact and expeditious methods of gauging the boats, and of guarding against the various errors and frauds to which the scheme might be liable; a task for which his great mathematical

† The prices of coal about this period were as follows:
In Birmingham manufacturers were supplied with coals from 6*s.* to 10*s.* per ton, smiths at 17*s.*, and families from 9*s.* to 12*s.*
In the county of Warwick in 1812 coal sells at the pits at 11*s.* 8*d.* to 12*s.* per ton.
We learn from the "Survey of the County of Stafford" that in 1804 the price of coals at the collieries is from 7*s.* to 8*s.* per ton.
And from the Survey of County of Shropshire we also learn the price of coals at the pits was from 4*s.* to 6*s.* per ton. 1801, p. 272.
The author of Fossil Fuel, in 1835, says:—The Manor Pits, near Sheffield, supply Sheffield with 159,000 tons of coal per annum. There are other inferior sources of supply. The prices of household coal is about 7*s.* 6*d.* per ton.

‡ Farey's Derbyshire, 1811.

§ General View of the Agriculture and Minerals of Derbyshire, by John Farey, senior. 1811, p. 182.

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knowledge and extensive practice as a coal master and coal viewer eminently fitted him, and for his services in these matters, the canal companies mentioned, and presented him, on the 18th of January 1805, with a large and elegantly ornamented silver cup and cover, with a suitable inscription, as a testimony of the high sense entertained of his ability and indefatigable attention in completely carrying into effect the plan of weighing and gauging vessels, &c.

Weight of canal boats, 1808.

"In the autumn of 1808, when I visited this district, four octavo volumes of the particular measurements of canal boats had been printed by Tupman & Co., of Nottingham, (of whom I believe they can be purchased by anyone,) which contained every particular of the history of each boat, and its dimensions at each inch, like the inching of vessels by excisemen, viz., of 430 wide boats and 60 narrow boats used on these navigations, with all the necessary introductory remarks and rules for their use.

"Lord Middleton and William Drury Lowe, Esq., were mentioned to me as the only considerable coal masters, whose coals pass on the Cromford, Erewash, and Nottingham canals, who had not come into the plan above mentioned for ascertaining the weight and collecting the money for their coals. One of the coal masters showed me the general account rendered to him from weighing office for 12 months to the end of June 1808, from which I extract the following particulars, viz.:

A.D. 1808. Coal carried by canal.

"'That in that space of time 8,286 boat loads of coals passed on the above three canals, in their way towards the places of consumption, which contained,—

Hard coals - - -	- 205,006 tons.
Soft „ - - -	- 37,289 „
Cobbles - - -	- 27,161 „
Cokes - - - -	- 24,384 quarters.

"'The value of which amounted together to 122,838*l.*'

"The hard coals are, as appears by the above account, almost the only coals which the buyers for the midland counties south and east of Derbyshire will purchase, and only such are deemed hard coals as can be loaded into the boats in pieces from near the size of a man's head, at the smallest, to the largest pieces which can be lifted by two or three men. The soft coals of these districts do not croyle or melt together in burning, except in few some instances, (when they are called smithy coals, as at Benty-field, Dunston, Hollinwood Common, Swadlincote, Troway, and other places,) and are tender and liable to break small by keeping, or unless moved with the utmost caution; yet, I see no reason to doubt that by some of the care that we in London are obliged to use in moving coals, and in mixing the large coals of one sort with the small of another, owing to the high duty we pay on the article, (from which the districts alluded to are wholly exempt,) that a large portion of the soft coals, now nearly, if not entirely, wasted in the working of the hard coals here and about Wednesbury, in Staffordshire, and numerous other places, might be sold and used, and this invaluable article be by that means husbanded for the use of future generations, as well as rendered cheaper to the present. The waste of soft coals, to which I allude, in hurrying after the hard seams because more saleable, exceeds all belief, and is a subject to which the owners of the soil ought more to attend than they do, and, perhaps, the legislature ought to take up the subject; allowing soft coals which do not croyle to be brought to London by canals, or carried generally by sea coastways at considerably lower duties than hard or croyling coals, would perhaps go far towards remedying this crying evil, which cannot be fully seen or understood without entering into the underground operations of the collier, although enough of it may be seen on the wharfs and railway branches of the Nutbrook canal in particular to satisfy any one that a change is wanting."

The Derby canal, 1800.

The Act for the Derby canal was obtained in 1793, so that in the first years of 1800 it was actively engaged in the carriage of coal. It was indeed constructed chiefly with the view of better supplying the populous town of Derby with coal, by means of its connexion with the Erewash and Cromford canals, and by the railways which extend to the collieries north of the town. It was enacted that 5,000 tons of coal should be allowed to pass free on this canal for the use of the poor.* The Derby Canal Company were compelled to buy the interest of the Derwent river, which they did for 3,996*l.*† As little other than coal for Derby passed on this part of the river, some idea of the quantity may be formed. It is convenient to advance in this place to 1819, when a railroad was completed from Pinxton to Mansfield, and connected with the Cromford canal. The amount of tonnage from 1819 to 1826, four of five years, is stated to have been as follows:—

A.D. 1816 to 1826.

Coal to Pinxton - - -	- 52,366 tons.
„ Mansfield - -	- 175,326 „
Total	- 227,692 „

Ironworks, 1806.

In 1806 we find, from a return given by Farey, that there were 11 ironworks in Derbyshire, having 18 blast furnaces, of which 12 were that year in blast making 10,329 tons of pig iron. Those ironworks will have used for all purposes not less than 80,000 tons of coal.

Proposed tax on iron, A.D. 1806.

In the same year, 1806, a bill was brought into Parliament, having for its object a tax of 2*l.* per ton on all the pig iron made. The opposition to this bill brought together a series of facts respecting the progress and extent of the iron trade, showing that at this time the make had increased to 250,000 tons annually, which represent a consumption of above a million and half tons of coal.

In 1829, according to the evidence of Mr. Buddle, the inland coal trade was interfering with the trade of the northern coalfield to the extent of 4,078,508 chaldrons, or 10,808,046 tons per annum.

Canals. A.D. 1816.

In 1816 the coal owners of Northumberland and Durham complained that they were subjected to a constantly increasing competition by the operation of canal navigation, and, as reported by Mr. G. R. Porter,‡ of railways. The influence of canals will be well understood after a perusal of the following notes on the progress of inland navigation:—Between 1755 and 1759 the Sankey Brook

* Glover's History of Derbyshire.

† Historical Account of the Navigable Rivers, Canals, &c., by Joseph Priestly, Esq., 1831.

‡ Progress of the Nation, by G. R. Porter, Esq., 1847, p. 382.

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canal was formed and opened, connecting the coalfield of St. Helen's with the Mersey. In 1759 the Duke of Bridgewater obtained his first Act of Parliament, by which he was enabled, guided by the genius of James Brindley, to construct the celebrated Bridgewater canals, connecting Worsley and Manchester, and furnishing another outlet for the coal of that section of the Lancashire coalfields. In the history of canals those constructed by Brindley cannot be overlooked.

Duke of Bridgewater's canal. 1758.

His Grace the Duke of Bridgewater, having an estate at Worsley* rich in mines of coal, from which he derived little or no advantage because of the expense which attended its conveyance to a suitable market for its consumption, Mr. Brindley, who, having surveyed the country, declared it practicable, in 1758 and 1759 his Grace, having obtained an Act of Parliament, employed Mr. Brindley, who undertook to construct it. Having completed the canal as far as Barton to the navigable part of the river Irwell, where he proposed to carry it over that river by an aqueduct 39 feet above the surface of the water, it was commenced in September 1760, and the first boat sailed over on the 17th July 1761. The canal was then extended to Manchester, afterwards to Liverpool, and in 1762 an Act of Parliament was obtained to extend the canal to the tideway in the river Mersey.

Grand Trunk canal.

Upon Mr. Brindley's report an Act of Parliament was obtained to construct a canal between the rivers Trent and Mersey; in 1760 this canal was called the Grand Trunk, but is now known as the Staffordshire canal.†

A.D. 1772.

The next great work was a system of canals to connect the ports of Bristol, Hull, and Liverpool. These canals were completed in 1772.

The canal from Droitwich to the river Severn, for the conveyance of salt and coal, was also Mr. Brindley's work. Some short time before his death he began the canal which connects Oxfordshire with London. His last canal was from Chesterfield to the river Trent, which his brother-in-law, Mr. Henshall, finished in 1777.

Trent and Mersey navigation.

Following those works, many important systems of inland navigation were carried out. The Trent and Mersey, or the Grand Trunk canal, was completed in 1777, which, joining the Bridgewater canal near Runcorn, stretches to Newcastle-under-Line, passes southward to Titchfield, and then north-westerly until it joins the Trent at Wilden Ferry on the north-west extremity of Leicestershire. Water communication between Hull and Liverpool was thus completed. Within a very few years the following systems of inland navigation opened up yet more completely the great coalfields and manufacturing districts of England:—

The Staffordshire and Worcester canal;
The Liverpool and Leeds;
The Birmingham and Wolverhampton;
Birmingham to Fareley and Coventry;

A.D. 1792.

The Grand Junction, begun in 1792.

The Oxford and other central canals continued the line of inland water communication.

The river Lea navigation and the Cambridge junction effected the required communication with the Wash.

In Scotland:—

The Forth and Clyde canal was completed in 1790.
The Glasgow and Paisley canal was commenced in 1807.

The effect of such a system of canals upon the coal trade of Northumberland and Durham will be readily understood. The influence of the then existing railways is a far more uncertain matter. The only railways (excepting small private lines on some few collieries) on which coal could be carried at this time were the following:—‡

Date of Act for Construction.	Name of Railway.	Between	Length in Miles.
1802	Carmarthenshire	Llanelly and Llanfihangel Aberbythick.	16
	Sirhowey -	Newport and Sirhowey furnaces	11
1808	Kilmarnock -	Kilmarnock and Troon - -	9¾
1809	Forest of Dean -	Newnham and Churchway engine	7½
	Severn and Wye	Lidbrook and Newern - -	26
1810	Monmouth -	Howler, Slade, Monmouth	—
1811	Hay - -	Brecon and Parton Cross - -	24
	Llanfihangel -	Abergavenny and Llanfihangel Crucorney.	—
1815	Gloucester and Cheltenham.	Gloucester and Cheltenham -	9

* The Borough of Stoke-upon-Trent, by John Ward, 1843.

† When the Duke of Bridgewater undertook this great design (the construction of the Bridgewater canals) the price of carriage on the river navigation was 12*s.* the ton from Manchester to Liverpool, while that of land carriage was 40*s.* the ton. The Duke's charge on his canal was limited by statute to 16*s.*, and, together with this vast superiority in cheapness, it had all the speed and regularity of land carriage. The articles conveyed by it were, likewise, much more numerous than those by river navigation. Besides manufactured goods and their raw materials, coals from the Duke's own pits were deposited in yards at various parts of the canal, for the supply of Cheshire." Aikin's *Description of the Country round Manchester*, p. 116.

‡ Wooden railways in collieries were introduced between 1632 and 1649. In 1777 Mr. Carr, of Sheffield, introduced underground rails in lieu of sledges. In 1794 cast-iron rails were partially used on the Walbottle Railway.

Horses were generally used as the means of traction underground until 1820.

The first public railway, the Stockton and Darlington, opened in the north for the conveyance of coal, minerals, and passengers, was opened in 1825. The motive power first used was horses. The Rocket engine of Stevenson was subsequently employed. *Industrial Resources of the Tyne, Wear, and Tees.*

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If we now direct our attention to the great coalfields of Durham and Northumberland we get a more precise return, by which we are enabled to trace the progress of our coal trade in a far more satisfactory manner. In the first place we give the total shipments from the northern ports from 1801 to 1850, for the most part in decennial periods.

See also Appendix, Nos. 28 and 32, p. 55 and 57.

——	Tons.	Increase or Decrease from previous Ten Years.
		Tons.
NEWCASTLE.		
From 1801 to 1810, both inclusive -	15,488,784*	—
„ 1811 „ 1820 „ -	18,227,100	+ 2,738,216
„ 1821 „ 1830 „ -	20,649,788	+ 2,422,688
„ 1831 „ 1840 „ -	25,429,476	+ 4,679,688
„ 1841 „ 1850 „ -	32,185,304	+ 6,755,828
SUNDERLAND.		
From 1801 to 1810, both inclusive -	8,370,644	—
„ 1811 „ 1820 „ -	10,020,639	+ 3,649,995
„ 1821 „ 1830 „ -	13,527,941	+ 3,507,302
„ 1831 „ 1840 „ -	12,164,714	— 1,363,147
„ 1841 „ 1850 „ -	18,340,200	+ 6,175,406
STOCKTON.		
From 1821 to 1828, but only for four years.	110,211	—
From 1833 to 1840, both inclusive -	8,293,984	+ 8,183,773
„ 1841 „ 1844 „ -	6,658,833	
	—1,635,151	
„ 1845 „ 1850 „ -	4,300,881	+ 2,715,730
	—2,357,952	
Total of 10 years -	11,019,714	
HARTLEPOOL.		
From 1845 to 1850, both inclusive -	6,581,039	—
NORTH SHIELDS.		
From 1848 to 1850, both inclusive -	1,249,143	

Appendix, Nos. 29 and 33.

Appendix, Nos. 30 and 33.

Appendix, Nos. 31 and 33, p. 56.

An examination of this table, and of the detailed tables of the shipments from the northern ports given in the Appendix, will show that the rate of increase in the total shipment of coal was as follows:— Appendix, Table 28, p. 55.

NEWCASTLE, from	1801 to 1810 - - -	26·8	per cent. increase.
„ „	1811 to 1820 - - -	23·03	„ „
„ „	1821 to 1830† - - -	20·05	„ „
„ „	1831 to 1840 - - -	27·28	„ „
„ „	1841 to 1850 - - -	6·68	„ „
SUNDERLAND, „	1801 to 1810 - - -	58·04	„ „
„ „	1811 to 1820 - - -	29·38	„ „
„ „	1821 to 1830‡ - - -	27·35	„ „
„ „	1831 to 1840 - - -	4·36	„ decrease.
„ „	1841 to 1850 - - -	88·42	„ increase.

Appendix, Table 29, p. 55.

STOCKTON.—The first shipments of coal took place in 1822, this being 1,224 tons. In 1828 this had increased to 66,051. For four years no return can be obtained.

From 1833 to 1840 - - -	157·57	per cent. increase.
„ 1841 to 1844 - - -	000·9	„ decrease.
„ 1845 to 1850 - - -	40·0	„ „

In 1844 the Great North of England Railway carried from this coalfield 130,930 tons. The details of this appear in the Appendix. This was the first interference with the shipments of coal in the Newcastle district. We find the coal at once makes its way to Thirsk, Shipton, York, and other places. Appendix, No. 33, p. 57.

* In 1800 the vend from the Tyne was 685,280 chaldrons.
„ „ Wear was 303,459 „
Total - - 998,739

The prices of coal in the Tyne being 20*s.* 6*d.*, and in the Wear 18*s.* per Newcastle chaldron.

† The vend from the Tyne in 1800 was 685,280 Newcastle chaldrons.
1826 „ 844,965 „ „
1828 „ 785,407 „ „
The vend from the Wear in 1800 having been 303,459 tons.

‡ In 1800, by coast and export, 303,459 chaldrons of coal were sent from Sunderland; in 1828, 532,508 chaldrons; the exportation in the 28 years being nearly 12,000,000 chaldrons.

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In 1845 shipments commenced at Hartlepool, which interfered with the shipments from Stockton. The shipments from Hartlepool increased 76·6 per cent. from 1845 to 1850.

In 1848 North Shields began to ship coals, between which year and 1850 there was an increase equal to 34·62 per cent.

To put this in another form, the total shipments from Newcastle and Sunderland, the only shipping ports of importance for coal until 1841, were as follows. After that period we obtain returns of shipments from Stockton,* Hartlepool, and North Shields:—

In 1801	- - - - - - -	1,956,674 tons.
1811	- - - - - - -	2,607,507 „*
1821	- - - - - - -	3,051,174 „
1831	- - - - - - -	3,515,260 „
1841, including the shipments from Stockton	- -	6,148,035 „
1850, including also the shipments from Hartlepool and North Shields	- - - - -	8,471,828 „

Appendix, No. 34, p. 57.

In 1801 the total shipments from the ports north of the Humber amounted to 2,115,506 tons. In ten years there was an increase to the extent of 777,674 tons, or more than 36 per cent. The account is not continued beyond 1816, in which year 3,187,063 tons were exported, showing an increase of 14 per cent nearly.

In addition to the returns and tables already given, we have the following information of the vend of the Tyne, Wear, and Tees as given by Mr. Buddle before the Select Committee on the Coal Trade in 1836.

Tyne Vend.

	Newcastle Chaldrons.		Tons.
1830 - - -	729,075½	=	1,932,050
1831 - - -	703,989	=	1,865,520
1832 - - -	616,094	=	1,682,649
1833 - - -	No return. An open trade.		
1834 - - -	588,970 { from Mar. 1 to Dec. 31. An open trade. }		1,560,770
1835 - - -	716,612	=	1,849,021

Wear Vend.

1830 - - -	455,068	=	1,205,930
1831 - - -	421,903	=	1,118,042
1832 - - -	441,452½	=	1,196,347
1833 - - -	No return. An open trade.		
1834 - - -	365,824 { from Mar. 1 to Dec. 31. An open trade. }		919,433
1835 - - -	446,456	=	1,183,108

Tees Vend.

1834 - - -	98,538	=	261,244
1835 - - -	112,941	=	299,293

Hartley, Cowpen, and Netherton.

1834 - - -	38,197½	=	101,223
1835 - - -	42,977½	=	133,184

Aggregate for the Regulated Collieries.

1835 - - -	1,318,984	=	3,495,207
1834 - - -	1,091,544	=	2,892,671
Increase -	227,410		602,536 in 1835 as compared with 1834 or 20¾ per cent.

In addition to this we have the coal traffic of the Stockton and Darlington Railway for 1841–43.

Statistics and calculations, by Samuel Sait, 1845.

Coal and Coke Tonnage on the Stockton and Darlington Railway for three years.

Years.	Darlington.	Yarmouth.	Stockton.
	Tons.	Tons.	Tons.
1841	27,040	15,114	21,629
1842	22,939	11,864	20,526
1843	19,400	13,384	19,544
Totals -	69,379	40,362	61,699
Average -	23,126	13,454	20,566

A.D. 1805.

* From Hartley and Blyth there appears to have been exported yearly between 1801 and 1811 about 30,000 Newcastle chaldrons of coal, or 79,500 tons, which do not appear in the above.

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While we are examining the rate of increase in the production of coal in our great northern coalfield, it is not uninteresting to find, within the period under our consideration, an estimate ready to our hands of the then (1829) rate of production, and of the probable duration of that coalfield.

ESTIMATE OF THE EXTENT AND PRODUCE OF THE DURHAM AND NORTHUMBERLAND COALFIELDS.

Duration of Northern coalfield. A.D. 1829.

	Square Miles.	
"From South Shields southward to Castle Eden 21 miles; thence westward to West Auckland 32 miles; north-east from West Auckland to Eltringham, 33 miles; and then to Shields 22 miles; being an extent of area of	594	
Northumberland.		
"From Shields northward, 27 miles, by an average breadth of 9 miles	243	
		837
Portion excavated.		
"In Durham-on-Tyne, say	39	
"In Durham-on-Wear, say	40	
	79	
"In Northumberland, say 13 miles by 2	26	
		105
		732

	Tons.
"Estimating the workable coal strata at an average thickness of 12 feet, the contents of 1 square mile will be 12,390,000 tons, and of 732 square miles	9,069,480,000
"Deduct one-third part for loss by small coal interceptions, by dikes, and other interruptions	3,023,160,000
Remainder	6,046,320,000

"This remainder is adequate to supply the present vend from Newcastle, Sunderland, Hartley, Blyth, and Stockton, of 3,500,000 tons, for a period of 1,727 years."

"It will be understood that this estimate of the quantity of coal in Durham and Northumberland can only be an approximation, especially as the south-eastern coal district of Durham is yet almost wholly unexplored; but the attempt is made in the hope of satisfying your lordships that no apprehension need be entertained of this valuable mineral being exhausted for many future generations.

"There is also a considerable extent of coalfields in the northern and south-western districts of Northumberland; but the foregoing comprises that which is continuous, and most suitable and available for exportation. It is, however, to be observed that the shipments of coal from the ports mentioned by Mr. Taylor has been largely increased during the last dozen years; so that supposing the estimate to be in other respects accurate, it must now be modified accordingly."—(Lords' Report, 1829, p. 124).

Dr. Buckland, the celebrated geologist, considered the foregoing, Mr. Taylor's estimate, as greatly exaggerated; but in an examination before the Committee of the House of Commons in 1829, he quoted with approbation a passage of Bakewell's Geology, in which it is stated that the coal-beds in South Wales were alone sufficient to supply the then demand of England for coal for 2,000 years.

Dr. Buckland on duration of coal.

In 1832 the coal owners, merchants, brokers, and others memorialised the Treasury as follows:—

"The export of sea-borne coal has greatly declined in the countries of Denmark and Germany. The quantity had diminished 51,000 tons in 1832 as compared with 1830, 1831.

"That in Holland (to which country the export of English coal is the greatest), since the Belgian revolution, the Prussian coal has been brought in in immense quantities.

"That it appears from a statement made by the French Board of Trade, that the consumption of foreign coals in 1832 in France exceeds 6,000,000 of hectolitres, only 500,000 of which are exported from England, the remaining five and a half millions from Belgium.

"The memorialists submit that no other article of British produce is taxed so high as coal, the export duty upon which amounts to 50 per cent. ad valorem; that the repeal of the duty would occasion a great increase."

The table given in connexion with this memorial will aid us in arriving at something like an approximation to the quantity of coal produced in the Newcastle coalfield during any year in the first ten of the present century.

	Tons.
Average total vend of coal, COASTWISE and FOREIGN, (*all best coal,*) from Newcastle and Sunderland	2,642,721
Small coal, some of which was used for manufacture, but the largest quantity burnt on the waste heaps	1,250,000
Coke for blast furnaces, &c. in making pig iron, *estimated as coal*	28,000
Carried forward	3,920,721

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	Tons.	Tons.
Brought forward		3,920,721
Coal (beyond the above small coal) used in malleable iron works	15,000*	
Chemical works	20,000†	
Glass works	2,000‡	
Earthenware and fire brick works	3,000§	
Sundry manufactures	5,000	
		45,000
Domestic consumption. The population of Newcastle being in 1801 33,048, and that of Sunderland 24,998, those towns being the principal coal consumers. In 1801 the population of Northumberland and Durham amounted to 317,402, and in 1811 it was 348,562. The consumption of this period would not have been one ton per head per annum, but say		500,000
The total estimated average production, say		4,465,721

Appendix, No. 38, p. 61. An examination of the number of ships leaving the ports of the Tyne, the Tees, and the Wear, and the ports of the Humber, in the years 1831 to 1841 inclusive, carrying coal, will show the importance of the trade at that time.

Mr. Buddle's evidence, 1829. Certain it is, however, that at this period the increased facilities which were being rapidly given to the producers in Mid-England were seriously affecting the Northern coal trade. This is strikingly shown by the following extract from the evidence of Mr. Buddle before the Committee of the House of Lords:—‖

"Can you state how far the sea-borne coal goes up into the country?

"It depends on circumstances, whether they are opposed by the inland coals by canal or railway.

"Where do they meet the inland coal now?

Ditto, A.D. 1816. "It is extremely difficult to state that; but I have a report made by a committee in 1816 who travelled round the island to see what interference there was with the sea-borne coal * * * This paper I hold in my hand is dated 1816. The quantity then supposed to be sold, and interfering with our vend, was 4,078,508 chaldrons."

We have the estimate upon which Mr. Buddle appeared to found his conclusions.

Coal of Midland counties, 1816. Extract from a report of a deputation from the Wear, sent to inquire into the quantities of coals conveyed by canals and railways in different parts of the kingdom in 1816:—¶

	Chaldrons.
"In Yorkshire	967,406
"In Derbyshire	355,554
"In Nottinghamshire	186,666
"In Leicestershire	66,666
"In Warwickshire	162,962
"In Staffordshire	300,000
"Quantity that passes towards the eastern sea	2,039,254
"And there is good reason for believing that an equal quantity passes towards west and south	2,039,254
"Quantity supposed to be sold annually without paying duty, and carried by canals and railways	4,078,508

* "With cheap fuel, and water-power in sufficient quantity to drive small hammers, forges were erected at various suitable localities * * * * * It is needless to say the weight of metal so manufactured was small." This would be, no doubt, all large coal. The small, which was at this date largely wasted, has been estimated at one half of the vend. Much of this small coal was used for steam-engines at pits, and in manufactures. Many, however, will remember the fiery heaps of small coal which blazed around Newcastle from 40 to 50 years since.

We have no reliable information respecting the quantity of coal used in the manufactures of Durham and Northumberland at any earlier date than 1800. About 1740 Mr. T. Cookson appears to have erected an iron furnace at Whitehill and Chester Le Street, in which he used coked coal, and produced 25 tons of iron a week, using, it is calculated, about 60 tons of coke. In 1812 the Tyne Iron Company had two furnaces in blast, each one making about 49 tons per week, or together about 5,000 tons of iron per year, from the two furnaces. For the production of each ton of iron, 2·40 tons of coke, which would represent 4·20 tons of coal, were used. We may estimate from this the total quantity of coal consumed in those furnaces as about 22,000 tons. To this should be added the coal used in the blast engine, and for calcining the iron ore, which would be, looking at their small consumption, not less than one ton for each ton of metal. Thus those works would have used from 26,000 to 28,000 tons of coal a year.—*Industrial Resources of the Tyne, Wear, and Tees*, p. 113.

† We are favoured with the following in answer to our inquiries, from a gentleman who is fully acquainted with the history of chemical works on the Tyne:—"In reply to your note of 20th ultimo, it is very difficult to give the exact quantity of coals "consumed in chemical works in Durham and Northumberland in 1800 to 1810, but as far as I can ascertain it would not exceed "20,000 tons per annum. There were very few chemical works then in operation, and the Walker Works were decidedly the "largest, and the coal at that time did not exceed 6,000 tons per annum." At this time the only alkali works on the Tyne appear to have been those of—

W. Losh and others, at Walker, established 1796.
Doubleday and Easterby, at Bill Quay, established 1808.
Dr. Hutchinson, at Felling, established early in present century.

‡ The record of blown plate glass at South Shields in 1750 is still extant.

§ The manufacture of earthenware was introduced by Mr. Warburton about 1740, the works being near Gateshead. In 1755 Mr. Byers had works at Newbottle in Durham. Thompson and Maling had works at North Hylton in 1762, and six or eight other potteries were built between that date and 1814. Firebricks were made on the Tyne 100 years since.

‖ Report from the Select Committee of the House of Lords appointed to take into consideration the state of the coal trade of the United Kingdom, 15 June 1829.

¶ The following is from the "Statistics and Calculations" of Samuel Salt. Quantity of coals passing by inland navigation and by railroads in different parts of the country in 1816:—

(*Continued on next page.*)

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In this "Extract" chaldrons are given; but we are not informed if the London or Newcastle measure is intended. Seeing that the report was made by a committee from the Wear to the northern coal owners, we suppose it must be Newcastle chaldrons. This will give us, therefore, the production of coal in the kingdom, without the Durham and Northumberland coal, as rather more than ten millions and a half tons.

With any one looking thoughtfully at this statement, there will naturally arise feelings of considerable uncertainty as to receiving this statement with any confidence. Some of the quantities given are clearly approximations, and that quantity, especially of coal passing "west and south,"—given as it is in a massed sum,—can scarcely be regarded as other than a shrewd guess. Still, as those figures result from a deputation especially sent round England to make the inquiry, and having a real interest to arrive as nearly as possible at a correct result, we may presume that the total quantity, allowing under the circumstances for a slight tendency to exaggerate, may be received as an approximation to the truth.

Mr. Buddle's estimate.

According, however, to Mr. Buddle's statement, the quantity of coal passing eastward from the midland counties was, reckoning the chaldron at 53 cwt., the Newcastle weight was 5,404,023 tons. The other coalfields of England and Wales were supposed to produce an equal quantity. The total production, therefore, of all the coalfields other than the Newcastle and the Scotch coalfield would be nearly 11 million tons. The complaints of the northern coal owners was that a very large portion of this was sold annually, passing by canal and river, without paying duty.

A.D. 1816.

In 1816 the vend of coal coastwise and foreign amounted to 2,876,683 from the northern ports. There will have been some, but not a large increase in the consumption of coal in the ironworks and manufactures; and the population of the two counties will have increased to about 378,000 people. Allowing the quantity of waste coal to have been the same as in the previous computation, the result will show that about 5,000,000 tons of coal were raised in the Newcastle coalfield when the deputation reported that nearly 11,000,000 tons were raised in the other coalfields of the kingdom.

The actual figures of our computation for 1816 are—

	Tons.
Durham and Northumberland	4,826,683
The remainder of the kingdom	10,808,046
Total	15,634,729

Accepting these figures for the present, as a probable close approximation, we refer to the additional evidence which will be given bearing directly on the correctness.

Iron manufacture.

Admitting the improvements which by this time had taken place in the manufacture of iron, not less than 1,768,264 tons of coal will have been used in 1823, and certainly more than two millions and a half in 1830. This should be compared with former statements.

Account of coal trade from a newspaper of 1843.

The following account, showing the rapid increase of the northern coal trade, appears in the Newcastle Advertiser in 1843.

"In 1770 there were only 13 collieries on the Tyne, and in 1803 there were upwards of 30. In 1838 the number was increased to 41 on the Tyne, and to 18 on the Weir, making in all 59. The estimated powers of working possessed by these collieries, that is, the quantity of coals they are able to raise in the year, are calculated by the late Mr. Bubble, the most accurate and experienced viewer ever known in the trade, at 5,887,520 tons.

A.D. 1836.

"In 1836 the number of collieries was again augmented on both rivers, and their powers of working extended to 8,123,922 tons yearly, being an increase in seven years of 2,236,400 tons, or nearly 38 per cent. In addition to this there were in that year new collieries already shipping coal, but not in the regulation, capable of producing another million of tons, which swells the increase per cent. to nearly 55, or considerably more than half. Still the Tees is not included. From the year 1826, when coals first began to be shipped on the Tees, up to 1835, the quantity increased year by year, from 18,588 to 357,726 tons, conveyed along the Stockton and Darlington Railway alone. But in 1836 the Clarence Railway was in operation, and we may fairly assume the powers on the Tees in that year to have exceeded half a million tons. Thus then, from 1826 to 1836, the aggregate capabilities of the whole district has sprung from 5,941,812 (including the Tees) to 9,623,922, showing an increase of 3,682,130 tons, or fully 62½ per cent. Taking the next septennial period, from 1836 to 1843, the ratio is equally progressive. Hartlepool in the interval has become a great and flourishing port, and all the collieries shipping there, with the exception of Thornley, are creations belonging to this cycle. Lord Londonderry's own snug little harbour of Seaham has grown into magnitude, and tripled its trade within the time. Two joint stock companies have during the while been formed, each with a capital of nearly half a million sterling, and which have sunk nearly the whole of their funds in exploring new coalfields. Moreover, on the Blyth, the Tyne, the Wear, and the Tees, multitudinous fresh winnings have been made by private individuals and companies; whilst an entirely new district around Warkworth has been called into existence. In the same period, or nearly so, seven additional public railways for the conveyance of coal have been opened in the county of Durham alone. The impulse has in truth been

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	Tons.
Yorkshire	2,563,626
Derbyshire	942,218
Nottinghamshire	494,665
Leicestershire	176,665
Warwickshire	431,849
Staffordshire	795,000
Quantity that passed towards the Eastern sea	5,404,023
Quantity believed to pass towards the Western sea	5,404,023
Quantity carried by canal and railways	10,808,046
Thus giving	27,020,115 of tons as the production of the kingdom in 1816.

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attended with amazing consequences. The region of developed coalfields has been extended in every direction, until it describes a vast circuit, stretching from the Coquet in the remote north, the sterile waste of Cockfield Fell in the far west, sweeping round Middleham on the extreme south, to be stopped by the German Ocean on the east. We cannot estimate the increase of powers thus obtained at less than 3,000,000 of tons yearly; so that the aggregate capabilities of the district may be assumed at upwards of 12½ millions of tons per annum, being much more than double the quantity that could have been raised in 1828."

London coal trade from 1801.

THE COAL TRADE OF LONDON is in many respects important, and as guiding us in our consideration as to the total quantity of coal raised in the United Kingdom, most especially so. The following table places this in a satisfactory manner before our readers; showing the quantity of coal imported in chaldrons and tons, and the relation which the importation bore to the population from 1801 to 1828.

The result being as follows:—

	Chaldrons.	Population.
In 1801 the population of London and its immediate vicinity was stated to be		818,129
The imports of coal for that year	859,738	
In 1811 the population was		953,276
The average import of 10 years ending 1811	993,182	
The population increased 1·65°/₀ per annum for 10 years.		
The whole average increase of import was 15·52°/₀.		
In 1821 the population was		1,144,531
The average import of coal for 10 years ending 1821	1,161,784	
The population increased 2·33°/₀ per annum.		
The whole average increase of import was 19·61°/₀.		

It appears the import of coal did not, in these latter 10 years, retain the same rateable proportion of increase as the preceding 10 years.

1·65 : 15·52 : : 2·33 : 21·91
19·61

2·30 abated percentage of increased import; about 9 chaldrons for eight persons before the general extension of gasworks, and 10 chaldrons since.

In 1800 a competent authority informs us that 1,005,352 chaldrons of coals were imported, paying a duty of 9*s.* 3*d.* $\frac{6}{10}$.*

Consumption of coal in London 1801 to 1828.

A STATEMENT of the adjusted IMPORTATION of COALS to LONDON since 1801, with the consumption for each head of the population.

Date.	Chaldrons of Coals.	Converted into Tons of Coals.	Population.	Authority for Population.	Chaldrons of 25½ cwts. per Head.
1801†	859,738	1,096,166	818,129	Census of 1801	1·05
1802	881,031	1,123,314	831,628		1·06
1803	902,324	1,150,463	845,127		1·07
1804	923,617	1,177,612	858,626	Presumed	1·07
1805	944,910	1,204,760	872,125	annual rate	1·08
1806	966,203	1,231,909	885,624	of increase	1·09
1807	987,496	1,259,057	899,123	about 1·65	1·09
1808	1,008,789	1,286,206	912,622	per cent.	1·105
1809	1,030,082	1,313,354	926,121		1·112
1810	1,051,375	1,340,503	939,620		1·118
1811†	1,072,668	1,367,652	953,276	Census of 1811	1·12
1812	1,093,959	1,394,798	972,184		1·125
1813	1,115,252	1,421,946	991,249		1·125
1814	1,136,546	1,449,096	1,010,314	Presumed	1·124
1815	1,117,034	1,424,218	1,029,379	annual rate	1·08
1816	1,149,650	1,465,804	1,048,444	of increase	1·09
1817	1,182,266	1,507,389	1,067,509	about	1·107
1818	1,214,882	1,548,974	1,086,574	2 per cent.	1·118
1819	1,247,498	1,590,560	1,105,639		1·127
1820	1,280,114	1,632,146	1,124,704		1·18
1821	1,312,730	1,673,731	1,144,531	Census of 1821	1·146
1822	1,345,345	1,715,315	1,163,596		1·156
1823	1,377,961	1,756,650	1,182,661	Presumed	—
1824	1,410,577	1,798,486	1,201,726	that the	—
1825	1,443,193	1,840,071	1,220,791	same rate	—
1826†	1,475,809	1,881,656	1,239,856	of annual	—
1827†	1,508,425	1,923,242	1,258,921	increase has	—
1828†	1,541,041	1,964,827	1,277,986	continued.	—
Total -	32,580,515	41,540,156	28,868,085	—	$1\frac{12}{100}$

This table has been constructed from the evidence of Mr. Charles Perkins, given before the committee of the House of Lords, 1829.

* An epitome of the progress of the trade in coal in London since 1775. By J. R. Scott of the Coal Exchange, London.

† Another Return gives as follows:—

1826 - - -	2,040,291 tons.	1828 - - -	1,960,559 „
1827 - - - -	1,882,321 „	1829 - - - -	2,018,975 „

—Accounts and Papers, House of Commons Library, Vol. XXXVIII., 1833, p. 199.

(Continued on next page.)

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Report from the select committee of the House of Lords appointed to take into consideration the state of the Coal Trade in the United Kingdom, &c., &c., 15th June 1829. Select Committee of the House of Lords, 1829.

The mean annual rate of increase for 28 years, from 1801 to 1828 inclusive, is 22,507 chaldrons, or 27,697½ tons.

The mean annual rate of increase for 14 years, from 1801 to 1814 inclusive, is 21,293 chaldrons, or 27,148 tons.

The mean annual rate of increase for 13 years, from 1815 to 1828 inclusive, is 32,616 chaldrons, or 41, 585 tons.

From another return made to the House of Commons we are enabled to continue the statistics of coals, cinders, and culm imported into the Port of London until 1837.* Return to the House of Commons, 1835-1837.

—	Tons.	By Inland Navigation.
		Tons.
1825	1,856,606	—
1826	2,040,291	—
1827	1,882,321	—
1828	1,960,559	—
1829	2,018,975	—
1830	2,079,275	—
1831	2,045,292	8,381
1832	2,139,078	10,724
1833	2,010,409	4,395
1834	2,078,685	1,862
1835	2,298,812	—
1836	2,398,352	—
1837	2,626,997	—

The "Accounts and Papers" of the House of Commons inform us that in 1801 London received 1,011,119 chaldrons by sea and from other lines of communication. The return which is given in Appendix shows that in 1827 this quantity had increased to 1,558,810 tons. Appendix, No. 39, p. 61.

In addition to the above we have the following ACCOUNT of the QUANTITIES of COAL brought Coastwise and by Inland Navigation into the Port of London during the Years 1833, 1834, 1836, 1837, and 1838.† Appendix, No. 36, p. 60.

Ships.					From whence shipped.	Tons.				
1833.	1834.	1836.	1837.	1838.		1833.	1834.	1836.	1837.	1838.
3,387	3,625	3,757	3,816	3,651	Newcastle - - -	1,060,839	1,142,908	1,235,406	1,279,890	1,187,532
2,369	2,036	2,542	2,780	2,629	Sunderland - - -	666,787	559,105	743,849	834,862	788,747
773	1,007	1,064	1,383	1,637	Stockton - - -	170,690	221,971	268,222	370,530	424,454
178	248	285	282	328	Blythe and Seaton Sluice -	48,689	64,268	71,775	71,856	76,178
67	176	157	154	278	Leith, Inverkeithing, Kirkaldy, and other parts of Scotland.	15,138	39,487	22,674	18,735	30,025
130	135	132	140	218	Swansea, Llanelly, Milford, and other parts of Wales.	32,156	33,200	35,237	35,018	51,914
173	177	225	165	262	Hull, Goole, Gainsborough, and other places in Yorkshire.	16,110	17,751	21,189	16,016	22,230
—	—	—	—	—	Quantity which passed the boundary stone on the Grand Junction Canal at Grove Park, Herts, and the River Thames at Staines.	4,395½	1,862	1,199½	2,324	1,685½
7,077	7,404	8,162	8,720	9,003	Total - - -	2,014,804½	2,080,547	2,399,551½	2,629,321	2,582,770½

In the history of the coal trade, there are some curious points, showing the mistaken views of our ancestors connected with the duties levied on our native productions.

And in a Report "*On the State of the Coal Trade,*" made to the House of Commons July 1830, the quantities of coal brought into London in 1801, 1811, and 1828 are given as follows:

1801 - - -	836,971 chaldrons.
1811 - - - -	1,096,872 „
1828 - - - -	1,476,063 „

The difference arises in this way: "The total import of coal in 28 years has been 32,580,515 chaldrons. The import in each "year has *occasionally* been over or under the proper quantity; the amount therefore, against each year, has been an apportioned "one, to ascertain, as nearly as possible, the consumption of coal per head per annum. On the gross average, if 28,868,085 persons "consume 32,580,515 chaldrons, each person consumes one chaldron and $\frac{12}{100}$ths."

CHARLES PERKINS.

* For a detailed statement of the district from which this coal was derived, see Appendix, Table . The tables in Appendix give returns of the districts from which the coal was derived from 1828 to 1835 for seaborne coal, and for 1833 and 1834 for inland navigation.

† Statistics and Calculations by Samuel Salt 1845.

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Appendix, No. 37, p. 60.

In the Appendix will be found an especial account of the coals received in 1836 and 1837, and short notices of several Acts relating to the coal trade of London.

The following table shows the amount of duties which have been annually received on coal imported into the Port of London and by inland conveyance up to 1822:—*

Date.	Imported into the Port of London.	By Inland Conveyance.	Prices of best Coal per Chaldron.†	Amount of Duty per Chaldron.
	£ s. d.	£ s. d.	s. d.	s. d.
1800	39,155 10 3	—	—	9 3½
1801	38,391 0 0	—	—	—
1802	35,149 11 8	—	—	—
1803	39,451 18 3	—	—	9 4
1804	40,429 4 0	—	—	—
1805	39,538 10 5	—	44 9	—
1806	40,292 15 2	252 5 5	44 5	—
1807	38,409 7 0	246 12 6	45 10	—
1808	43,838 19 11	254 4 4½	49 3	—
1809	41,257 8 7	175 12 1	54 6	12 6
1810	44,577 12 1	407 1 5½	51 8	—
1811	46,084 12 2	151 6 3	47 8	—
1812	45,019 4 11	198 11 3	44 10	—
1813	43,466 12 6	104 16 5½	52 5	—
1814	42,585 13 11	171 10 7½	59 1	—
1815	50,884 7 0	183 14 9½	46 9	9 4
1816	46,326 15 8	110 18 3½	41 8	—
1817	47,919 6 6	81 5 5	40 4	—
1818	50,617 7 9	76 8 9	39 10	—
1819	49,376 11 8	54 4 2	41 10	—
1820	52,410 17 6	39 8 9	42 11	—
1821	52,752 16 4	52 7 8½	43 8	—
1822	54,850 19 9	36 11 5½	43 0	—

The following table places the whole question of the coal trade of London in a satisfactory light from 1800 to 1834.

COAL TRADE in the PORT of LONDON, compiled by THOMAS GILLESPY, Secretary to the Joint Committee of Coal Factors and Buyers, 1833, 2nd March 1835.

YEARS.	War.	Peace.	Delivery in Chaldrons.	Delivery in Statute Tons.	Rate of Duty. A s. d.	Periods of Years. B	Average of them in Chaldrons.	Increase.	Decrease.
1800	War	..	1,005,352	1,275,448	9 3 4/10	1778 to 1802	883,132¼	7,557	..
1801	Do.	..	859,738	1,046,165	Do.	1779 to 1803	913,986¼	30,854	..
1802	Do.	..	902,284	1,150,412	Do.	1800 to 1804	930,969½	16,982½	..
1803	Do.	..	940,470	1,199,099	9 4	1801 to 1805	924,152½	..	6,816
1804	Do.	..	947,001	1,207,426	Do.	1802 to 1806	949,755¼	25,602	..
1805	Do.	..	971,270¼	1,238,369	Do.	1803 to 1807	955,925 1/20	6,172¼	..
1806	Do.	..	987,750¾	1,259,381	Do.	1804 to 1808	985,444¼	29,515	..
1807	Do.	..	933,148	1,189,763	Do.	1805 to 1809	980,752¼	..	4,712
1808	Do.	..	1,088,050	1,387,263	Do.	1806 to 1810	1,010,525¼	29,798	..
1809	Do.	..	923,440	1,637,387	12 6	1807 to 1811	1,036,009½	25,484¼	..
1810	Do.	..	1,120,237½	1,425,802	Do.	1808 to 1812	1,063,652¼	27,642	..
1811	Do.	..	1,115,171	1,419,343	Do.	1809 to 1813	1,040,222¼	..	23,429
1812	Do.	..	1,071,361½	1,360,985	Do.	1810 to 1814	1,083,567½	43,345	..
1813	Do.	..	970,901½	1,237,898	Do.	1811 to 1815	1,082,927¼	..	640
1814	Do.	..	1,140,168½	1,451,219	Do.	1812 to 1816	1,102,774½	19,846	..
1815	..	Peace	1,117,034½	1,424,218	9 4	1813 to 1817	1,116,080¼	13,306	..
1816	..	Do.	1,214,405½	1,548,366	Do.	1814 to 1818	1,162,408¼	46,328	..
1817	..	Do.	1,137,891½	1,450,310	Do.	1815 to 1819	1,170,283½	7,875½	..
1818	..	Do.	1,202,541½	1,533,239	Do.	1816 to 1820	1,209,624	39,340½	..
1819	..	Do.	1,179,544½	1,503,918	Do.	1817 to 1821	1,220,796	11,172½	..
1820	..	Do.	1,313,736½	1,674,988	Do.	1818 to 1822	1,244,024½	23,228	..
1821	..	Do.	1,270,270½	1,669,594	Do.	1819 to 1823	1,288,640½	44,634	..
1822	..	Do.	1,254,031	1,598,889	Do.	1820 to 1824	1,353,744	65,095	..
1823	..	Do.	1,425,662½	1,817,719	Do.	1821 to 1825	1,373,021½	19,276½	..
1824	..	Do.	1,505,021½	1,918,902	6 1	1822 to 1826	1,435,343½	62,321½	..
1825	..	Do.	1,410,120½	1,797,903	Do.	1823 to 1827	1,475,256½	39,943½	..
1826	..	Do.	1,581,879½	2,016,895†	Do.	1824 to 1828	1,498,328½	23,042½	..
1827	..	Do.	1,453,747½	1,853,526	Do.	1825 to 1829	1,515,240	16,911½	..
1828	..	Do.	1,540,875½	1,964,615	Do.	1826 to 1830	1,557,056½	41,816½	..
1829	..	Do.	1,589,577	2,026,710	Do.	1827 to 1831	1,556,491½	..	565½
1830*	..	Do.	1,619,202½	2,064,505	Do.	1828 to 1832	1,578,336½	30,845	..
1831*	..	Do.	1,579,055	2,013,295	Do.	1829 to 1833	1,608,769½	21,433½	..
1832*	..	Do.	1,607,972	2,057,303½	Free	1830 to 1834	1,608,116½	..	653½
1833	..	Do.	1,648,041	2,101,258½	..	..	..	..	..
1834	..	Do.	1,586,311½	2,028,546½	..	..	..	..	..

A The duty was paid to Government. Independent of it a local duty of 1s. 2d. a chaldron was paid until 1833 to the City of London for metage and orphans' duty, and 1d. a chaldron for market dues. Since 1807 both these duties have been collected together at the rate of 1s. 1d. per ton (1835). A discount of 2½ per cent. from this sum was allowed if the duty was paid within 15 days of the entry, and was continued until the Consolidation Act of the 10th May 1787 took away all discounts and fractions, and made the duty 8s. 10d. per chaldron.

B Taking 5 years of delivery and dividing them, the average may be assumed as the *consumption* of the middle year, but whether this be so or not, the system of averages equalizes the great fluctuation of seasons, the large or small amount of stock on hand or on sale, which it will be seen in the table of delivery have often differed to the amount of 100,000 chaldrons in each succeeding year. Notes by Thomas Gillespy.

* A return for those years appears in the London Imports as given in "Accounts and Papers," House of Commons Library, Vol. XXXIII., 1833:—

1830 - -	2,079,275 tons.
1831 - -	2,045,292 ,,
1832 - -	2,139,078 ,,

These differences and similar ones, which will be observed between this and the previous table, probably arise from the returns having been given to different dates, or it may have been owing to the uncertainty attending the returns of such measures as chaldrons, vats, and bushels.

† A separate return gives the amount of coal, culm, and cinders imported into London in 1826 as 1,600,229 chaldrons, equal to 2,040,291 tons, at 25¼ cwt. to the chaldron.

* From Report from Select Committee on the Coal Trade, (Port of London) Bill, June 13, 1838, p. 261.

† The prices are given on the authority of Mr. J. R. Scott's Epitome of the Progress of the Trade in Coal to London.

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In the Appendix will be found a series of tables giving a comparative statement of the coals imported into London from several ports in England, Wales, and Scotland, for eight years, between 1828 and 1835. From these tables we find that the shipments from Newcastle fell off in the last four years to the extent of 536,531 tons. This is, however, accounted for by the increased shipments at Sunderland of 214,456 tons, and at Stockton of 685,352 tons. The shipments from those ports will also explain the decline in the shipments from Blyth and Seaton Sluice, which fell off in the last four years 30,627 tons. See Appendix for a return of the shipments from the Tyne, Tees, Wear, and Humber to 1841. Appendix, Table No. 40, p. 61.

In the total imports into London there was a steady increase, in 1828, 6,750 ships, bringing 1,960,559 tons of coal, and in 1835, 7,958 ships, bringing 2,298,812 tons.

From the Yorkshire ports, Hull, Goole, &c., in the first four years (1828–1831) 100,538 tons were shipped for London, and in the last four (1832–1835) 112,744 tons. The Scottish ports sent in the same first four years 89,321 tons, and in the last four 145,159 tons; whilst from Wales London received in the first four years 26,799 tons, and in the last four 148,988 tons. Some other particulars are given to which reference will be made, and which add to the value of the information collected in reference to the London coal trade of this period.

Within the period under consideration we have returns showing the coal brought by inland navigation since 1805. In 1805, by the Grand Junction Canal, London received 2,579 tons; this had increased in 1810 to 7,614 tons, which was the maximum quantity until 1831, when 10,742 tons were received by inland navigation in London. Another return appears in the Appendix evidently made up to another period of the year, giving the coal carried by the Grand Junction Canal from 1831 to 1852, and the coal brought coastwise and by inland navigation for 1841 and 1842. In 1834 only 1,862 tons were received, in 1837 only 2,324 tons, 1,685 tons only being brought in 1838.§ In 1844, 72,256 tons are returned as having been brought by inland navigation and land carriage. In the next year the railways begin to deliver coal in London; the following table showing the traffic until 1850. Appendix, No. 41, p. 63. Appendix, No. 42, p. 63. Appendix, No. 43, p. 64. Appendix, No. 44, p. 64.

COAL and CULM brought into London by INLAND NAVIGATION and RAILWAY from 1832 to 1850.

The amount of duty under Act 1 & 2 Will. IV. c. 76. for maintaining the market for the sale of coal, and subsequent Acts, was 1*s.* 1*d.* per ton. This was applicable to public improvements within the metropolis.

Date.	By Railway.‡	Tons.
	Tons.	
1832*	—	10,742
1833*	—	4,395¼
1834*	—	1,862
1835*	—	1,004
1837*	—	2,324
1838	—	1,685
1839	—	12,933
1840	—	22,188
1841	—	33,594
1842	—	31,519
1843	—	34,684
1844†	—	72,256
1845	8,377	68,687
1846	11,698	33,629
1847	19,336	41,967
1848	37,888	60,849
1849	19,639	41,640
1850	55,098	85,579

* Mr. Buddle, of Newcastle, and Mr. Horne, of Westminster, estimate the annual consumption of coal in London at 1,500,000 chaldrons of coal per annum in 1835.

† Returned to an order of the House of Commons from the Inspector General's Office, Custom House, Wm. Irving, Inspector General. This is returned in 1844 as by inland navigation and land carriage. This is the case until 1851, when the returns are again separated.

‡ Returns of railways on which dues have been paid to the chamberlain of the city of London.

§ A STATEMENT of the QUANTITY of COAL brought by INLAND NAVIGATION to LONDON, for the Six Years from 1832 to 1837, and the Amount of the several Duties payable thereon.

——	Number of Tons.	Duty of 1*d.* per Ton, payable to Coal Market Fund.	Duty of 8*d.* per Ton, payable to London Bridge Approaches Fund.	Duty of 4*d.* per ton, payable to the Corporation.
		£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Brought by Grand Junction Canal, passing the boundary stone at Grove Park, Herts:—				
In the year 1832	10,742	44 15 2	358 1 4	179 0 8
1833	4,395¼	18 6 3¼	146 10 2	73 5 1
1834	1,862	7 15 2	62 1 4	31 0 8
1835	1,004¼	4 3 8¼	33 9 8	16 14 10
1836	1,199¼	4 19 11¼	39 19 6	19 19 9
1837	2,324	9 13 8	77 9 4	38 14 8
Brought by the River Thames, passing the boundary at Staines	Nil.			

Extract from Report from Select Committee on the Coal Trade (Port of London) Bill, June 13th 1888, page 140.

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Railways carrying coal to London.

In the Appendix will be found tables setting forth the history of the earliest traffic in coal to London by the first railways.

Appendix, No. 44, p. 64.

There are some points of considerable interest in connexion with the London coal trade, and incidentally with that of the kingdom, in the following quotations.

Mr. F. Finch on London coal trade.

In answer to a question put by Mr. Hume, Mr. Francis Finch replied as follows:

"(*Mr. Hume.*)* Are you prepared to lay before the Committee the price of the coals as delivered, and the expense of bringing them to Paddington?—I am quite prepared to do that; but I should recommend to the Committee to consider the cost of the coal, and then the tonnage and the expense of haulage separately. I will state first the cost of the coal at the pit's mouth in the year 1828. Perhaps I ought to state, to show the authenticity of the return, that it is a return from a colliery of my own which I let, and where my tenants are bound to return what they raise with accuracy. In the Michaelmas quarter of 1828 the average price was 7*s.* 11*d.* for large coals, 3*s.* 7¼*d.* for the intermediate description of coal, which, I think, was described as being hand picked in the north, we call them lumps; for the smallest description of coal 2*s.* 9¼*d.* In the Michaelmas quarter of 1829 the average price of large was 6*s.* 8*d.*, lumps 3*s.* 6¼*d.*, and slack 2*s.* 8*d.*; in Michaelmas quarter 1830 the average price of large was 7*s.* 9¾*d.*, lumps 3*s.* 4¼*d.*, and slack 2*s.* 8½*d.*; in Michaelmas quarter 1831 the average price of large was 6*s.* 11¼*d.*, lumps 3*s.* 4¾*d.*, and slack 2*s.* 9*d.*; in Michaelmas quarter 1832 the average price of large was 7*s.* 11½*d.*, lumps 4*s.* 1*d.*, and slack 2*s.* 0¼*d.*; in Michaelmas quarter 1833 the average price of large was 8*s.* 0¾*d.*, lumps 4*s.* 2¾*d.*, and slack 2*s.* 2¼*d.*; in Michaelmas quarter 1834 the average price of large was 9*s.* 1*d.*, lumps 5*s.* 4¼*d.*, and slack 2*s.* 8*d.*; in Michaelmas quarter 1835 the average price of large was 8*s.* 5¾*d.*, lumps 5*s.* 1¾*d.*, and slack 2*s.* 8*d.*; in Michaelmas quarter 1836 the average price of large was 11*s.* 6¼*d.*, lumps 7*s.* 2¼*d.*, and slack 3*s.* 6*d.*; in Michaelmas quarter 1837 the average price of large was 11*s.* 2*d.*, and of lumps 6*s.* 4*d.* There happened to be no slack produced that quarter.

"Now will you state the expenses up?—I believe the expense of haulage from that district up to London may be taken, with very slight variations, at 6*s.* 6*d.* per ton.

"Does that include canal dues?—No; it is haulage and boat hire; it may be called freight. The expense of canal tonnage amounts to 8*s.* 8¾*d.* a ton.

"Does that include from the collieries up to Paddington?—It does.

"Is there any other charge besides this?—None at all.

"The amount of the cost of the coal and the charge of conveyance and canal dues is for the large 1*l.* 6*s.* 4¾*d.*, and for the lumps 1*l.* 1*s.* 6¾*d.*?—Yes. I have nothing else to state to the Committee, except that there are other districts besides Staffordshire from which coal might be brought to London. There is a district of coal in the county of Derby and Leicestershire."

Appendix, No. 45, p. 64.

In 1823 the produce of the duty on coal imported into London was about 54,000*l.*, the inland conveyance producing only 48*l.* In 1838 the duty on seaborne coal was 85,120*l.*, that on inland coal 77*l.* 9*s.*

Appendix, No. 46, p. 65. *In this table, for convenient reference, the population of England and Wales is given since* 1801.

The population of London in 1801 was 818,129, when the coal received, and, with the exception of a small quantity, used, was 1,096,166 tons. In 1851 the population of the metropolitan county had increased to† 1,886,576, and in that year London received by sea 3,236,542 tons of coal, 24,206 by inland navigation, and 247,908 by railway, or more than three millions and a half tons, which will give about 1 ton 18 cwt. per head of the population of this great city.

Hugh Taylor on consumption of coal, 1829.

In 1829 Mr. Hugh Taylor made an analogous estimate of the consumption of coal in Great Britain.‡

	Tons.
The annual vend of coal carried coastwise from Durham and Northumberland is	3,300,000
Home consumption say one-fifth	660,000
	3,960,000
Which quantity supplies about 5,000,000 persons, and supposing the whole population of Great Britain to be 15,000,000, this must be trebled, for though these two thirds of population are perhaps less able to afford fuel, yet taking into consideration the manufacturing districts and the cheapness of coal in the interior, the estimate will not be too high	11,880,000
Consumed by iron works, say 600,000 tons of metal, to produce which requires at least four times the quantity of coal in making even pig metal, and the extraordinary consumption in the Cornwall, &c. mines	3,000,000
Consumed in Great Britain	14,880,000
Exported to Ireland, say	700,000
Total tons, exclusive of foreign exportation	15,580,000

* Extract from Report from Select Committee on the Coal Trade (Port of London) Bill.—June 13th, 1838, page 141.

Appendix, Table No. 46, p. 65.

† As the rate of increase in the population of the United Kingdom cannot but prove to be useful in considering the question of our coal consumption, a complete table is given in the Appendix, No. 46, showing the increase in each ten years from 1801 to 1861.

‡ Evidence, 15 May 1829, before Committee of Lords on state of the coal trade.

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In addition to the information already given we have the following returns:—

Coal exported from Newcastle and Sunderland *Coastwise* in each of the following years was as follows:

——	1822.	1823.	1824.
	Winchester. Chaldrons.	Winchester. Chaldrons.	Winchester. Chaldrons.
Newcastle - -	1,228,423	1,385,454	1,289,255
Sunderland - -	744,220	932,109	920,970

The vend of coals from the River Wear from the year 1824 to 1843 shows the increase to have been very small.*

Year.	Total Chaldrons.
1825	502,043
1826	518,285
1827	493,670
1828	500,601
1829	564,928
1830	523,557
1831	473,923
1832	454,265
1833	509,078½
1834	419,539
1835	410,872
1836	436,005½
1837	502,429½
1838	482,094
1839	483,957
1840	497,546
1841	509,049
1842	468,698½
1843	450,839

From 1819 to 1828 (ten years) we have accurate returns of all our shipments of coal for each year from the different ports of England, Scotland, and Wales. This table is so important that we retain it in the text. It shows that in 1819 we exported 4,635,040 tons, in 1828 we exported 5,603,807 tons, this being an increase in our exportation of coal of 968,767 tons in ten years.

COAL, CINDERS, and CULM exported from the different Ports of ENGLAND, SCOTLAND, and WALES, for the TEN YEARS ending 1828, from a table compiled by William Irving, Inspector-General of Imports and Exports.

Coastwise to other Ports of GREAT BRITAIN.

Years.	Coal and Cinders.		Small Coal.	Culm.	Total.
	Tons.	Imperial Chaldrons.	Imperial Chaldrons.	Imperial Chaldrons.	Tons.
1819	438,045	2,105,745	18	70,934	3,459,508
1820	437,074	2,423,263	71	105,911	3,947,908
1821	463,974	2,256,757	105	97,396	3,731,908
1822	491,094	2,301,770	427	88,953	3,810,239
1823	534,835	2,672,456	62	92,425	4,372,839
1824	547,939	2,587,880	232	121,091	4,308,571
1825	539,760	2,623,354	25,036	121,357	4,384,433
1826	557,355	2,788,125	78,758	139,360	4,730,307
1827	595,278	2,539,871	103,115	127,026	4,440,318
1828	645,471	2,586,266	75,097	121,201	4,507,935

* Extract from Collections relative to the Collieries and Coal Trade of the counties of Durham and Northumberland. Vol. xii.

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To Ireland.

Years.	Coal and Cinders.		Small Coal.	Culm.	Total.
	Tons.	Imperial Chaldrons.	Imperial Chaldrons.	Imperial Chaldrons.	Tons.
1819	156,581	354,439	21	15,168	669,660
1820	119,609	339,743	—	10,946	606,400
1821	140,851	352,600	—	10,441	644,787
1822	156,236	376,943	—	10,486	694,024
1823	166,131	373,333	112	6,415	693,413
1824	162,878	367,815	1,607	11,352	691,429
1825	159,723	368,815	2,368	15,036	695,832
1826	236,052	367,849	119	23,599	779,584
1827	198,857	306,289	30	19,214	650,728
1828	242,944	336,556	486	21,100	740,071

To British Colonies.

Years.	Coal and Cinders.		Small Coal.	Culm.	Total.
	Tons.	Imperial Chaldrons.	Imperial Chaldrons.	Imperial Chaldrons.	Tons.
1819	9,895	42,813	1,283	233	71,497
1820	9,191	56,500	1,784	254	90,447
1821	10,521	55,431	2,016	115	90,423
1822	9,741	54,821	18,719	—	111,822
1823	13,606	51,281	3,448	99	89,713
1824	12,211	60,254	2,684	—	99,575
1825	10,527	69,648	5,022	63	114,264
1826	42,490	55,231	2,796	288	123,437
1827	43,963	53,645	3,095	278	123,109
1828	50,563	53,277	2,458	118	128,092

To Foreign Countries.

Years.	Coal and Cinders.		Small Coal.	Culm.	Total.
	Tons.	Newcastle Chaldrons.	Newcastle Chaldrons.	Newcastle Chaldrons.	Tons.
1819	9,475	22,723	35,712	9	164,375
1820	7,081	20,536	36,509	159	158,672
1821	8,236	23,671	37,509	218	170,941
1822	9,692	22,425	38,892	216	172,754
1823	5,446	16,579	42,599	526	163,662
1824	10,952	18,783	44,349	515	179,617
1825	27,827	15,501	47,671	755	197,234
1826	45,518	9,222	57,565	270	223,219
1827	54,090	11,403	59,867	478	244,222
1828	38,507	11,056	60,315	26	227,709

Summary of Aggregate Quantities of Coal, Culm, and Cinders shipped to all parts.

Years.	Total Quantities shipped to all Parts, stated in Tons.
	Tons.
1819	4,635,040
1820	4,803,427
1821	4,638,059
1822	4,788,839
1823	5,319,627
1824	5,279,192
1825	5,391,763
1826	5,856,547
1828	5,458,377
1827	5,603,807
1833	6,493,627*
1834	6,437,816
1835	6,854,053

Accounts, House of Lords, Vol. CCLVIII., 1829, p. 122.

Appendix X. Statistics and calculations, by Samuel Salt, 1848.

* Mr. Samuel Salt gives a similar Table to the above, which is given in the Appendix; from 1833 to 1835 the quantities are taken from that table.

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	Tons.
In 1816 our total shipments *Coastwise* amounted to - - -	4,145,909
In 1817 „ „ „ - -	4,067,722
In 1818 „ „ „ - -	4,253,007
In 1816 our shipments to Ireland and Foreign countries amounted to	824,536
In 1817 „ „ „ „	873,806
In 1818 „ „ „ „	821,329

Shipments Coastwise and Foreign.

In addition to this table the following summaries of the shipments from the ports near to coalfields will show the state of the coal trade up to 1850. Full details are given in the Appendix.

SHIPMENTS of COAL from the BRISTOL and GLOUCESTER (including LYDNEY) and SOMERSETSHIRE COALFIELDS.

Appendix, Nos. 47 and 48, p. 66.

Years.	BRISTOL. Shipments.	GLOUCESTER. Shipments.	Total Shipments.	Increase over the previous ten Years.
	Tons.	Tons.	Tons.	Tons.
1819 to 1830 -	53,023	147,769	200,792	—
1831 to 1840 -	95,694	462,788	558,482	357,690
1841 to 1850 -	112,546	978,661	1,091,207	532,725

WALES.

SHIPMENTS of COAL from the SOUTH WALES COALFIELD.

SOUTH WALES. Appendix, No. 49, p. 66.

Years.	SWANSEA. Shipments.	CARDIFF. Shipments.	NEWPORT.* Shipments.	PEMBROKE.† Shipments.	LLANELLY. Shipments.	MILFORD. Shipments.	Total Shipments.	Increase over the previous ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1816 to 1818	638,533	864,300		85,524	162,934	1,895	889,750	—
1819 to 1830	2,508,117	650,944	3,083,233	—	729,607	201,394	7,123,395	—
1831 to 1840	3,231,538	1,014,264	3,166,256	—	1,007,629	390,774	8,810,461	1,687,066
1841 to 1850	4,458,840	4,547,574	5,670,251	—	2,148,942	612,783	17,438,390	8,627,929

To the year 1819 Cardiff and Newport were returned together.

* In the county of Monmouth there was a considerable increase of commerce in coal and iron, as shown by the following sums received for tonnages from navigation of canal :—

Years ending March.	£	Increase. £
1804 - - - - -	12,535	
1805 - - - - -	14,650	2,115
1806 - - - - -	17,752	3,102
1807 - - - - -	19,358	1,606
1808 - - - - -	21,208	1,850
1809 - - - - -	23,977	2,769
1810 - - - - -	26,664	2,687

We have no means of separating the coal and iron in this return, but the following statement of the iron works in operation at this time will aid in making a computation :—

Tredegar works - - - - -	4	
Sirhowey „ - - - - -	2	
Rumney „ - - - - -	2	
Union „ - - - - -	2	
Beaufort „ - - - -	2	
Ebbw „ - - - - -	2	
Nantyglo „ - - - -	2	
Blaenavon‡ „ - - - -	4	Blast furnace.
Clydach‡ „ - - - -	2	22

The make of these furnaces was about 2,000 tons of pig iron per annum.

	Tons.
The quantity of coals brought down to Newport in 1809 was - - -	185,800
And the quantity sent to different works short of Newport was - - -	25,284
Total - - - -	211,804

In this year (1809) the 185,800 tons of coal was exported, except what was necessary for consumption in the neighbourhood.
The price of coals nett put on board ship at Newport (1811) was 10*s.* 6*d.* per ton.
The Monmouthshire coal sold at Hereford for 40*s.* a ton weight in 1811.
By tram road to Hereford it was sold (coal) at 25*s.* per ton.
Monmouthshire coal sold at Monmouth in the same year at 24*s.* per ton, and Forest of Dean at 19*s.*

† After 1818 associated with Milford.

‡ These furnaces are in Brecknock, and near the northern boundary of Monmouthshire.

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In 1828 we find upwards of 64,000 tons of "stone coal or culm" were exported from Swansea In 1829 Newport, Swansea, and Neath shipped 550,000 tons of coal, and Cardiff 60,000. These figures are given on the authority of Mr. Holland, the author of "Fossil Fuel."

The same author, Mr. Holland of Sheffield, who certainly gathered up his information with great industry, gives us the following information connected with iron making in South Wales:—

"The quantity of coals consumed in the manufacture of iron is enormous.

"The quantity of iron annually manufactured in Wales has been calculated at about 270,000 tons. About three fourths is made into bars, and one fourth sold as pigs and castings.

"At this period the consumption of coal was thus estimated, including what was used for steam engines, workmen, &c., about five and a half tons to each ton of iron.

"The annual consumption of coal by iron works will, therefore, be about 1,500,000 tons."

Again Mr. Holland tells us:—

"The quantity of coal used in smelting copper ore imported from Cornwall, the manufacture of tin plate, forging of iron for various purposes, and for domestic use, may be calculated at 350,000 tons, making in all an annual consumption of coal in Wales equal to 1,850,000 tons."

EXPORT from WALES in 1828.

——	Coal.	Culm.	Total.
Cardiff -	32,109	—	32,109
Newport -	422,878	—	422,878
Swansea -	144,198	195,213	339,411
Llanelly -	84,386	7,758	92,144
Milford -	8,303	10,051	18,354
	691,874	213,022	904,896
Total Consumption and Export - -			2,754,895

This coal was distributed as follows:—

	Tons.
To Cornwall and S. W. England - - - -	687,041
To Ireland - - - - - - -	209,288
To the British Colonies - - - - - -	3,895
To foreign countries - - - - - -	4,672
Total export - - -	904,896

NORTH WALES. NORTH WALES.—The following shipments are from North Wales, but they are unimportant. Cardigan shipped 64 tons in 1821, and 35 tons in 1831. Beaumaris and Carnarvon in the three years ending 1810 shipped 82 tons coastwise, and 394 tons for foreign parts and Ireland; and from Beaumaris alone, probably coal from Anglesea, from 1821 to 1833, there were shipped 375 tons coastwise, and 310 tons to Ireland and for foreign parts.

In the year ending 5th January 1817 the following quantities of coal were imported into Wales from other ports of the kingdom*:—

* The following quantities of coal were imported into Wales from the Port of Liverpool in the year 1810:—

Ports.	Coals.	
	Chaldrons.	Tons.
Aberystwith - - - -	602	—
Barmouth - - - -	179	—
Beaumaris - - - -	6,991	—
Cardigan - - - -	160	20
Carnarvon - - - -	2,710	—
Conway - - - -	1,266	—
Holyhead - - - -	1,702	—
Milford - - - -	23	4
Pembroke - - - -	140	24¼
Pwlhely - - - -	1,454	—
Total - - - -	15,227	43¼

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Ports.	Coals.				Culm.	
	Chds.	Bush.	Tons.	Cwts.	Chds.	Bush.
Aberystwith -	2,224	24	—	—	995	4
Beaumaris -	20,310	19	—	—	3,703	7
Cardiff - -	49	3	62	5	481	0
Cardigan -	686	19	102	5	4,270	30
Llanelly - -	21	0	65	—	40	0
Milford - -	427	28	—	—	961	33
Pembroke -	1,017	31	246	5	7,644	18
Swansea -	40	30	86	—	173	0
Total -	24,778	10	561	15	18,269	20

Accounts and Papers, vol. 14, 1817, p. 275.

Iron Trade, 1767. Canal to Cardiff, 1791.

Iron Trade of Wales.—In the local history of Merthyr Tydvil* are some few notes on the iron trade and its bearing on the consumption of coal, which are of interest.

Bacon.—"Like the majority of iron masters at that time, he began to use coal and charcoal, and to "develope his coal wealth. In 1767 another furnace was built at Cyfarthfa, and in the same year the "coal works were commenced in sober earnest." "The first pit sunk was Wincle Vawr."

The first canal, "a few feet in width, was cut from Blaencanard to the Cyfarthfa yard;" and in 1791 a canal was constructed to Cardiff, and we learn that in 1805 9,906 tons of iron were sent down the canal.

Cyfartha.	Average Yield.	Total Yield.
	Tons.	Tons.
1819, 6 furnaces	65	29,000
1845–6, 11 „	80	45,760
1856 - - -	105	55,440
1857 - -	120	60,000

The advance of the iron manufacture and the improvement of the furnaces is shown by the following returns:—

	£
In 1796, as seen by parish book, Penydarren was rated at - -	3,000
Dowlais was rated at - - - - - -	2,000
Plymouth was rated at - - - - - -	750

In 1819 Penydarren furnaces were increased to five.

In 1828 89,959 tons of coal were raised at Dowlais at a cost of 5*s.* 2½*d.* per ton.

The canal company obtained their Act in 1790. The work was commenced the same year, and the navigation from Merthyr to Cardiff was completed in 1794. Two years after another Act was obtained for extending the canal to the sea, and in June 1798 the first vessel entered the sea-lock. The length of the canal is 25 miles long. The mountainous character of the country through which it passes places the head of the canal at Merthyr 568 feet above its extremity at the sea-lock at Cardiff. When the Taff Vale Railway was opened in 1840, it was imagined that the canal would be completely deprived of its trade, but this result, from the rapid increase in the trade of the port, has never occurred, though greatly increased facilities have been provided many a time since.

Taff Vale Railway and Canal.

The following are some of the statistics of the canal's progress:—

A.D. 1830 to 1840.

Years.	Iron.	Coal.
1830 - -	81,548	106,170
1831 - -	70,333	117,134
1832 - -	83,677	165,351
1833 - -	112,315	184,261
1834 - -	111,012	183,953
1835 - -	119,858	176,374
1836 - -	123,088	192,241
1837 - -	124,810	226,671
1838 - -	130,637	189,081
1839 - -	132,781	211,224
1840 - -	132,002	248,484

* History of Merthyr Tydvil.

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A.D. 1841 to 1850.

After the opening of the dock, the progress was as follows:—

Years.	Iron.	Coal.
1841 - -	150,696	245,467
1842 - -	140,022	325,825
1843 - -	149,072	353,108
1844 - -	102,815	234,467
1845 - -	152,406	272,553
1846 - -	145,760	287,269
1847 - -	156,693	262,077
1848 - -	155,014	281,665
1849 - -	156,196	247,785
1850 - -	202,379	352,127

"Trevitheck's high-pressure tram engine" ran on the 12th February 1804, carrying 10 tons of iron and 70 persons from Merthyr to Cardiff.

Another authority* confirms these statements. Mr. F. Foster says:—

	Tons.
The quantity of iron annually made in Wales is calculated at 270,000 tons, three quarters of which is made into bars, and one quarter into pigs and castings. The average quantity of coal required, including that used by engines, workmen, &c., is about five and a half tons for each ton of iron made. The annual consumption of coals by the iron works will be - - - - - - - - - - - -	1,500,000
The quantity of coal used in the smelting of copper, manufacture of tin plate for various purposes, and domestic use, may be estimated at - - - - - - -	350,000
Home consumption - - - -	1,850,000

Lancashire Coalfield.—The following tables will best show the progress of the coal trade of this district from 1819.

Appendix, No. 50, p. 69.

Shipments of Coal from the Cheshire and Lancashire Coalfields.

Years.	Chester. Shipments.	Liverpool. Shipments.	Runcorn.† Shipments.	Preston.‡ Shipments for Ten Years.	Fleetwood.§ Shipments for Ten Years.	Lancaster. Shipments for Ten Years.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819 to 1830	462,956	1,275,623	—	—	—	135,992	1,874,581	—
A.D. 1819 to 1850. 1831 to 1840	633,885	749,818	—	—	45,028	76,887	1,400,590	—
1841 to 1850	895,810	1,594,346	191,813	314,136	125,932	34,760	3,156,797	1,696,207

† No Return from Runcorn before 1847.
‡ No Return from Preston before 1843.
§ No Return from Fleetwood before 1839.

Liverpool and Manchester Railway.—In addition to the above, we are enabled to give the following information respecting the traffic in coal upon the Liverpool and Manchester Railway from its opening, which cannot but be instructive.

Railway 1831 to 1836.

——	1831. January to December.	1832. January to December.	1833. January to December.	1834. January to December.	1835. January to December.	1836. to 30th June.
Number of trips -	443	445	201	193	828	536

Railway Traffic in Coal.

——	1840. 1st July to 31st December.	1841. January to 1st July.	1841. July to December 31st.	1842. January 1st to December 31st.	1843. January 1st to December 31st.	1844. January 1st to December 31st.	1845. to July 1st.
Tons of coal carried -	46,809	(137,910)‖	47,304	96,958	98,834	115,992	75,114

* Observations on the South Welsh coal basin by Mr. Francis Foster, colliery viewer. Read June 15, 1830. Trans. of the Nat. His. Socy. of Northumberland, Durham, and Newcastle-upon-Tyne, Vol. I., p. 82, 1830.

‖ Goods and coal not separated.

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The following shows the quantity of coal consumed by steamers sailing from the port of Liverpool in 1844:— Facts and figures by Samuel Salt, 1848.

STATEMENT of COAL supplied to Steamers out of LIVERPOOL received by Flats from St. Helen's.

	Tons.
Government mail boats, all supplied from Liverpool	14,000
City of Dublin Steam Packet Company punctually supplied from Liverpool (part Kilkenny block coal)	32,000
Drogheda Company take coals from Liverpool as ballast, and sell it	18,000
Glasgow Companies, about one half from Liverpool (200 tons per week)	11,000
Belfast boats (Langtry and Co.)	5,200
"Troubadour," Bristol boat	1,000
"Nimrod," Cork	1,000
"Windermere," Ulverstone	1,000
Beaumaris and Isle of Man	1,500
Dumfries boats	1,000
Dundalk	4,000
"Countess of Galway"	1,500
"Duchess of Lancaster"	1,000
Londonderry boats	6,000
Newry boats	1,000
Wexford	1,000
Carlisle	3,500
Coleraine	3,000
Sundry other consumption, average of ferries annually	3,300
Total St. Helen's coal	110,000
Welsh coal supplied to the Halifax boats averages 20 trips, 600 tons per trip	12,000

STATEMENT of the Quantity of Coal and Slack brought into Liverpool during the Year 1844.*

From.	Conveyance.	Tons.
St. Helen's	By canal to Widness Dock	380,000
Ditto.	By railway to Runcorn Gap	140,000
Wigan		
St. Helen's, &c.	By Liverpool and Manchester Railway to Crown Street	100,000
Wigan	By Leeds and Liverpool Canal	470,000
Worsley	By Duke's Canal	25,000
Prescot, &c.	By turnpike road	20,000
	Total	1,135,000

	Tons.
Consumed in the town of Liverpool and neighbouring brickfields	450,000
Consumed in Cheshire, twelve ferries on the River Mersey, Dungeon works, &c.	50,000
Consumed by shipping for use in vessels' cabins alone	60,000
Consumed by steamers on river, to ferries, coastwise, &c.	110,000
Export to East and West Indies, Spain, Portugal, and all other places	465,000
Total	1,135,000

In the Appendix will be found an interesting statement of the coal trade of Manchester in 1834 and 1837. Appendix, No. 55, p. 77.

In 1835 in Manchester the price for the hard and small coal varied from 6*s.* 8*d.* to 10*s.* and 12*s.* per ton; and Liverpool at the same time was supplied with coals from Wigan, St. Helen's, and Prescot at from 10*s.* 10*d.* per ton household quality; and the price usually fluctuated from 11*s.* to 12*s.*

* Facts and figures principally relating to railways and commerce by Samuel Salt, 1848.

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CUMBERLAND. CUMBERLAND COALFIELD.—The following tables show very fully the state of this coalfield from 1819 to 1850.

Appendix, No. 51, p. 71.

SHIPMENTS of COAL from the CUMBERLAND Coalfield.

Years.	WHITEHAVEN. Shipments.	WORKINGTON. Shipments.	MARYPORT Shipments.	Total Shipments.	Increase over the last Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.
1819 to 1830	2,767,364	—	—	2,767,364	—
1835 to 1840	2,964,201	—	—	2,964,301	196,927
1841 to 1850	3,284,621	113,900	1,609,594	5,008,115	2,043,814

Whitehaven Shipments. We are enabled to give the return of a week's shipment at Whitehaven:—

——	Howgill Colliery.	Whingill Colliery.	Total.
	Waggons.	Waggons.	Waggons.
Monday - -	280	164	444
Tuesday - -	349	167	516
Wednesday - -	352	179	539
Thursday - -	358	171	524
Friday - -	378	210	588
Saturday - -	346	228	574
Total - -	2,058	1,119	3,177

Each of these Whitehaven waggons contains 27 Cumberland bushels, or 81 Winchester bushels, and weighs upon an average 41 cwt. at 112 lbs. The weight of the whole shipment will therefore be:—

152,496 hundredweight.
257,337 Winchester bushels.

A.D. 1807. This will have been on the third week in December 1807, from Lord Lonsdale's collieries.*

The average exports of coal from the Whitehaven collieries for five years ending December 1814 were 225,000 tons. This does not include the inland consumption.

The inland collieries about this time had an annual sale of 15,000 waggon loads of two and a quarter tons each. We may therefore estimate the total production thus:—

	Tons.
Exported - - - - - -	225,000
Inland sale - - - - - -	33,750
	258,750

YORKSHIRE. THE YORKSHIRE COALFIELD.—The only reliable information respecting the production of the Yorkshire coal is that which is given in connection with its exports. The large increase of these shipments prove the rapid extension of the colliery operations.

Appendix, No. 52, p. 71.

SHIPMENTS of COAL from YORKSHIRE Coalfield.

Years.	GAINSBORO. Shipments.	SCARBORO. Shipments.	HULL. Shipments.	GOOLE. Shipments.	GRIMSBY. Shipments.	BOSTON. Shipments.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	† Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819 to 1830	—	—	242,530		1,282	—	243,812	—
1835 to 1840	—	85	198,974	842,483‡	1,386	—	1,042,843	799,031
1841 to 1850	62,747	15	599,670	1,600,521	10,081	15	2,273,049	1,230,207

* From the "Tyne Mercury" of 6 January 1808.
† Hull and Goole returned together from 1819 to 1830; their returns were then separated.
‡ From 1828 to 1840.

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SCOTCH COALFIELD.—Within the following tables all the available information of the coal trade of Scotland will be found comprehended. SCOTLAND. Appendix, No. 53, p. 78.

The SHIPMENTS of COAL from 1821 to 1828 from Scotland were as follows:—

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1821 -	339,255	17,729	356,984	
1822 -	359,628	19,447	379,075	Including 72 imperial chaldrons and 120 Newcastle chaldrons of anthracite.
1823 -	358,832	14,797	373,629	Including 499 Newcastle and 88 imperial chaldrons of do.
1824 -	363,083	22,310	385,393	Including 384 Newcastle and 68 imperial chaldrons of do.
1825 -	356,755	24,534	381,289	Including 606 Newcastle chaldrons and 577 imperial chaldrons of do.
1826 -	382,827	28,140	410,967	Including 197 Newcastle chaldrons and 22 imperia chaldrons of do.
1827 -	283,073	31,320	314,393	Including 478 Newcastle chaldrons and 265 imperial chaldrons of do.
1828* -	420,328	34,671	454,999	Including 329 imperial chaldrons of do.
	2,863,781	192,948	3,056,729	For eight years:—

A.D. 1821 to 1828.

For eight years:—

Increase coastwise - -	81,073
Increase foreign - -	16,942
Total increase - - -	98,015
Increase per cent. - -	27·45

AN ACCOUNT of the Coals and Culm exported to Foreign Parts in each of the following Years from the Firth of Forth, Scotland.

Exports A.D. 1816 to 1820.

Years.	Years ending 5th January.	Coals.		Culm.	
		Tons.	Cwts.	Chds.	Bush.
1816	1817	5,223	8	—	—
1817	1818	8,148	5	92	0
1818	1819	6,724	19	175	0
1819	1820	5,602	12	51	0
1820	1821	4,524	9	—	—

Scotland, ports exporting—

Alloa, Anstruther, Boness, Dunbar, Grangemouth, Kirkaldy, Leith, and Prestonpans.

* The author of "*Fossil Fuel*" gives the coals shipped from Scotland in the year 1828 as follows:

	Tons.
For Great Britain - - -	233,838
„ Ireland - - -	40,295
„ British Colonies - - -	18,635
„ Foreign Countries - -	13,305
Total - -	305,573

And the coals imported into Scotland in the same year—

283,059 Tons.
194,109 Chaldrons.

From the Survey of Ayrshire the following notes are obtained:—

In the early part of the last century the manufacture of pig iron was carried on for some time by Lord Cathcart and others, after which it was sent to Banaw in the county of Argyle, where it was made into bar iron by the employment of charred peat.

In the year 1787 other works were established, in which from 300 to 400 persons were constantly employed.

The estate leased by the Muirkirk Iron Company: 9 tons of coal considered sufficient to make 1 ton of the best pig iron.

The Glenbuck Iron works were erected about 1790.

About 90,000 tons of coals are exported to Ireland, America, and other places (.809).

The iron works of Muirkirk and Glenbuck, when the furnaces are going, use nearly 200 tons per day.

The estimate of the produce of the county is thus formed:—700 pickmen; say 1,000 tons are put out daily for 5 days each week, will give 250,000 tons per annum.

PORT OF IRVINE.

1809. Year ending 5th April, exported to America, 247 chalders of coal.
1809. Coals exported to Ireland, 27,153 chalders.
1809. Coals carried coastwise, 1,415 chalders.
Brora, between the years 1814 and 1826, yielded 70,000 tons of coal.

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Scotch coal, from 1800 to 1816.

We obtain an insight into the Scotch coal trade from the following table for the years from 1800 to 1816:—

AN ACCOUNT of the COALS imported into the PORTS and HARBOURS on the EAST COAST of SCOTLAND, distinguishing Scotch from English Coal.

Years.	Scotch Coals.	English Coals.
	Tons.	Chaldrons.
1800	135,866	26,505
1801	130,865	20,833
1802	132,366	30,079
1803	126,694	28,159
1804	131,581	28,503
1805	133,116	31,722
1806	151,015	35,785
1807	156,101	39,769
1808	152,173	46,445
1809	158,842	38,913
1810	162,372	41,846
1811	146,157	40,108
1812	146,752	47,914
1813	141,327	40,047
1814	160,723	47,305
1815	155,721	46,981
1816*	43,164	11,184

* The returns for 1816 are for five months only.

This return is from the Custom House, Edinburgh, and bears date the 28th May 1816. Signed by Alex. Cleghorn, Inspector General of Imports and Exports.

Appendix, No. 54, p. 76.

In the Appendix will be found a table of the coal imported at Leith, Dundee, and Perth from 1801 to 1821, and also tables of the prices of coal, whether English or Scotch, at various places at this time.

Appendix, No. 54 (a).

AN ACCOUNT of the Quantity of Coals shipped from the different Ports in the Frith of Forth for the Year ending 5th January 1821, the Duty on Coal shipped to Foreign Ports at this time being 7*s.* 9*d.* per ton.

Ports.	Quantities.	
	Tons.	Cwts.
Alloa - - -	862	0
Boness - - - -	1,573	0
Kirkaldy - -	1,384	19
Leith - - - -	689	10
Prestonpans - -	15	0
Total -	4,524	9

Accounts and Papers, vol. xvii., 1821, p. 57.

The exports of coal is given in the following tables in decennial periods, which show the increase on the production of coal in the last ten years clearly.

Appendix, No. 53, p. 73.

SCOTLAND, PRINCIPAL WESTERN PORTS.

Scotland, Western Ports.

Years.	Glasgow. Shipments for Ten Years.	Irvine. Shipments for Ten Years.	Ayr. Shipments for Ten Years.	Greenock. Shipments for Ten Years.	Total Shipments.	Increase over the last Ten Years.	Increase per Cent.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
1830 to 1840 -	659,428	1,435,677	417,385	165,068	2,677,558	—	275·64
1841 to 1850 -	960,236	2,272,624	752,508	224,369	4,209,737	1,532,179	24·36

SCOTLAND, PRINCIPAL EASTERN PORTS.

Scotland, Eastern Ports.

Years.	Grangemouth. Shipments.	Borrowstoness. Shipments.	Kirkaldy. Shipments.	Leith. Shipments.	Dundee. Shipments.	Alloa. Shipments.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1830 to 1840	546,032	1,038,989	420,800	288,728	8,231	—	2,302,780	—
1841 to 1850	163,132	1,422,435	709,960	220,123	41,040	806,763	3,363,453	1,060,673

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Shipments from the smaller ports of Scotland :—

	Tons.	Increase.
From 1835 to 1840, total shipments - -	- 36,267	
From 1841 to 1850, do. - -	- 71,136	
		34,869

COASTWISE DISTRIBUTION OF COAL, and RAILWAY and CANAL DISTRIBUTION.—In the Appendix will be found a table showing the quantities of coals imported into the various ports of the United Kingdom in 1827 and 1828. For convenience, the returns for those years are placed in juxtaposition with similar returns for 1867 and 1868. The general increase in the consumption of coal is very clearly shewn. There are some few instances of a decline, as at Weymouth, where 42,442 tons were received in 1827, and only 19,667 tons in 1828 ; and even in 1867 and 1868 the quantity of coal imported at Weymouth was only a little more than 26,000, the causes of this being of a purely local character. Appendix, No. 56, p. 77.

The totals of coal received at all the ports of the United Kingdom were not very dissimilar in the two years 1827 and 1828, being 4,766,259 tons in the former and 4,986,808 tons in the latter year ; the quantities had, however, doubled themselves in 40 years. Of the shipments to Ireland we obtain a further insight by the return of the coal imported from 1816 to 1847 given in the Appendix. Appendix, No. 57 A, p. 79.

The Select Committee of the House of Commons on the coal trade of 1836, which was at a time when the coal owners of the north were greatly alarmed at the extension of the railway system, and the probable interference of the coal of the Midland Counties, which would be carried by the new lines over the country free of duty, while the sea-borne coal was subject to taxation, had to consider the question of securing to the public, and especially to London, a reduction in the prices of coal. A meeting of coal owners at the British Coffee House, 16th April 1836, agreed to retain counsel against some railway bills, and we find they passed the following resolution :— A.D. 1836.

"It was resolved unanimously, That in the opinion of this Meeting the projected South-west Durham Railway is injurious in principle to the interests of the coal trade, as well as the South Durham Railway, and that the coal trade ought to co-operate with and assist the landed proprietors, lessors, and lessees, of coal mines and wayleaves upon the line of the South-west Durham, in their opposition to that railway now before Parliament." Railway extension.

It was shown in the Committee's report, that the coal owners were by their "regulations" keeping back coal for the purpose of maintaining a high price.

They give—

"The following statement of the powers* of the Tyne and Wear from actual examination shows a great increase in 1836 as compared with 1829."

	In September 1829 the Powers were Tons.	In June 1836 the powers were Tons.	Increase of Tons.		
On the TYNE River -	- 3,115,936	4,809,824	1,693,888	or	54·3 per cent.
On the WEAR River -	- 2,776,586	3,314,098	542,512	or	19·5 per cent.
Total -	- 5,887,552	8,123,922	2,236,400	or	36·9 per cent.

"The aggregate vend of all the collieries within the 'regulation' was only 3,495,207 tons; whilst the '*powers*' of the Tyne and Wear alone were 8,123,922 tons; showing that all collieries are capable of producing three times the quantity which the regulation permits to be used."

It was pressed upon the Committee by the coalowners that a short supply would follow a continuance of open trade, with the consequent cheapening of coal, and increased use of it. They combat this by the above statement made on the strength of the evidence drawn from the witnesses examined, and by showing that new collieries were then (1836) opening, "capable of producing an additional supply "million tons of coal yearly. Collieries opening:— Mr. H. Morton's Evidence, Committee, 1836. Mr. John Buddle's Evidence, Committee, 1836.

	Tons.	Tons.	
" 7 on the WEAR =	551,200	948,700	of best coal, 16·8 %.
" 2 on the TYNE =	87,450		
" 6 on the TEES =	310,050		of inferior coal, 8·89 %.

"Total 25 per cent. increase on the present issue of the vend of 3,693,890 tons."

At this time "the supply from Scotland has increased from 89,321 tons, the average of the four "years 1828–31, to 145,159 tons on the average of the four years 1832–35, showing an increase of "55,838 tons; whilst the supply of *London by inland navigation may be considered as at an end, as it has* "*decreased from* 8,381 *tons in* 1831, *and* 10,742 *in* 1832, *to* 4,395 *tons in* 1833, *and to only* 1,862 *in* "1834." The evident special pleading in this statement, in which a temporary depression of the canal carrying trade, owing probably to the heavy charges upon each ton of coal so carried, must strike every one. Inland Navigation, fallacious statement of the Committee.

The Committee add the following additional piece of information:—"The quantity of coals from "Wales and from Yorkshire have increased from 227,337 tons in the four years 1828–31 to 261,732 "in the four years 1832–35, showing an increase in the whole time of 34,404 tons, although there has "been a decreased importation of Welsh culm of 19,338 tons in that quantity."

From the evidence of Mr. Frederick Page before the Committee of the House of Commons we gleam the following particulars relative to our inland trade in 1830,† from a map which accompanies the evidence:

In relation to the coal passing from the Gloucester and Somersetshire coalfields we find that—

The Kennet and Avon Canal supplies the town of Reading almost exclusively, and it is the limit of supply by this canal, with the exception of a few tons sent down the Thames. The Kennet and Avon Canal supply about 24,000 tons a year to Reading. Kennet and Avon Canal.

* These *powers* are calculated by single shift, that is by day's work alone, for the men eight hours and for the boys twelve, all piece work. More work could be done in an hour now (1836) than in 1829, but the union amongst the workmen prevents that being done.

† Report of Select Committee on the state of the coal trade, 13 July 1830.

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Somerset Canal.

The Somersetshire Canal is a feeder to the Kennet and Avon Canal; and when the coal comes to Reading, there is great competition with the sea-borne coal, and with the Staffordshire coal, which comes down the Oxford Canal, and there is also competition with the Forest of Dean to a certain degree. The Somersetshire coal comes from farther north than the Mendip Hills. It is all put into the canal boats from the pit's mouth.

Bristol and Somersetshire, 1830.

The *Bristol* coalfield is very limited—

The *Somersetshire* coal meeting it at Bath and Minchinhampton; all the country eastward of Wells and Yeovil, northward of Wincanton, Wilton, and Oakingham, and southward of Highworth and Abingdon, being supplied with the Somersetshire coal.

Gloucester, 1830.

The *Forest of Dean* coal is found at Hereford and Monmouth, at Gloucester, and at Whitney.

Forest of Dean.

The Forest of Dean coal gets to Reading, entering by the Stroudwater, and going down the Thames, but not to any extent. The Staffordshire coal and the sea-borne coal meet the Gloucestershire coal at Reading.

Durham and Northumberland, 1830.

At this time, according to this evidence, we find the coal from the *Durham and Northumberland* coalfield supplying all the east coast from Berwick to Dover, and from thence to Devonport, where it meets the Welsh coal.

The line of demarcation between the northern coal and Welsh coal in the south of England is fixed at somewhere about Devonport.

Proceeding inland, in the north we find the Newcastle coal supplying Carlisle, Appleby, Askrig, and Ripon.

Cumberland, 1830.

The *Cumberland* coalfield being limited to a district west of a line drawn from Askrig to Carlisle, meeting the Lancashire coal at the head of Morecombe Bay and at Hawes.

A thin strip of country from Kirby Moorside to Hull, and still further south to Boston, is supplied from the Newcastle coalfield, as is also all the country eastward of Spalding, Peterboro', Northampton, and Windsor, and proceeding westward by Oakingham, Andover, Salisbury, Sherborne, Crediton, to Plymouth, all the country to the south-east and south to the coast.

Lancaster, 1830.

The *Lancashire* coalfield supplies all the coast from the Medway to Morecombe Bay, and inland northward to Askrig and Kettlewell, where it competes with the Durham coal; while to the east it supplies all the country to Colne, Halifax, and Buxton; here it meets the Yorkshire supply; while Northwich and Macclesfield are the limits of its southern supply.

Yorkshire, Derbyshire, and Nottinghamshire, 1830.

The *Yorkshire, Derbyshire, and Nottinghamshire* coals supply the wide area between Knaresboro' and the north, Northampton on the south, Huddersfield on the west, and a line drawn from Pickering to Peterboro' on the east.

North Wales, 1830.

The *North Wales, Flintshire, and Denbighshire* coalfield sends its coal all round the coast to Festiniog on the south, and it reaches Chester and Macclesfield on the north. Inland all the country to the west of a curved line drawn from Newcastle-under-Lyne through Shrewsbury to Knighton is supplied from Flintshire and Denbighshire.

South Wales, 1830.

The *South Wales* coals supply all Cornwall and North Devon, meeting the northern coal at Crediton, and, further east, at Chard and Yeovil. From Bristol all South Wales to St. David's is supplied, and as far north as Harlech. A line drawn from Bala to Rhayder, Hereford, Monmouth, and Chepstow shows its eastern distribution.

Shropshire, 1830.

The *Shropshire* coal supplying the country westward of the Severn, eastward of Wem, Montgomery, and Presteign.

North Staffordshire, 1830.

The *North Staffordshire* coalfield principally supplies the district west of Derby, north of Stafford, south of Macclesfield, and east of Drayton.

South Staffordshire.

The *South Staffordshire* and the *Leicester and Ashby de la Zouch* coalfields supply all the county south of Burton-on-Trent to the River Thames at Henley and Maidenhead, up to the Severn on the west. It meets the Yorkshire coal along a line drawn from near Derby to near Northampton, and the Newcastle coal at a curved line drawn from Newport Pagnell to Great Marlow.*

Such was the distribution of coal up to the year 1830. We shall have to examine this by-and-bye in comparison with the distribution of the present time.

Iron Manufacture. A.D. 1740 to 1827.

Iron Manufacture.—The manufacture of iron bears so importantly on the consupmtion of coal that a few brief notices of the condition of that industry prior to 1850 appears necessary. From a carefully written paper in the Edinburgh Philosophical Magazine,‡ we learn the state of the iron (make) in each of the following years in Great Britain:—

1740	17,000 tons	from 59 furnaces.	
1788	68,000 „	from 121	„
1796	125,000 „	—	
1806	259,000 „	—	
1820	400,000 „	—	
1827	690,000 „	from 284 furnaces.	

The above return leaps from 1820 to 1827, but we are enabled to supply information more in detail of the last year, and to add some additional returns.

* In connection with the subject of the distribution of coal, we find Birmingham Canal Navigations returned the coals conveyed on the canal in the year 1837 as follows:—†

	Tons.	cwts.	Tons.	cwts.
Coals for supply of Birmingham	-	-	367,800	12
„ viâ Worcester Canal	175,545	7		
„ viâ Warwick Canal	203,164	19		
„ viâ Coventry Canal	9,212	15		
„ viâ Staffordshire and Worcestershire Canal	50,750	5		
„ from Whittington to Fazeley	12,954	11		
			451,627	17
„ for supply of works in the mining districts			772,167	7
Total			1,591,595	16

† Extract from Report from Select Committee on the Coal Trade (Port of London) Bill, June 13th, 1838 (page 140.)

‡ The Iron Trade of Great Britain. —*Edinburgh Philosophical Magazine*, 1828, p. 115.

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The make of the last-named year, 1827, is thus stated:—

——	Tons.	No of Furnaces.
Staffordshire	216,000	95
Shropshire	78,000	31
South Wales	272,000	90
North Wales	24,000	12
Yorkshire	43,000	24
Derbyshire	20,500	14
Scotland	36,500	18
Total	690,000	284

Iron manufacture, A.D. 1820.

Some additional evidence is afforded us by the information remaining on the make of pig iron at this time.

Mr. David Mushet writes:—"In a survey I made of the iron works about the year 1820, my "computation of the annual quantity of pig iron manufactured was as follows:—

	Tons.
"South Wales, &c.	150,000
"Staffordshire and Shropshire	180,000
"Yorkshire and Derbyshire	50,000
"Scotland and other places	20,000."

We next obtain the following information of the make of iron in 1823 and 1830:—

——	1823.	1830.
	Tons.	Tons.
Northumberland and Durham	2,379	5,327
Yorkshire	27,311	28,926
Derbyshire	14,038	17,999
Shropshire	57,923	73,418
Staffordshire	133,590	211,604
South Wales	182,325	277,643
Scotland	24,500	37,500
Total	442,066	652,417

The details are given in the Appendix.

Appendix, Table No. 35, p. 58.

THE MAKE OF PIG IRON.*

Counties.	Total No. of Furnaces.	Pig Iron made.	Total No. of Furnaces.	Pig Iron made.	Increase since 1823.	Increase per Cent.
		Tons.		Tons.		
Northumberland and Durham	2	2,379	4	5,327	3,916	123
Yorkshire	26	27,311	27	28,926	1,615	5
Derbyshire	15	14,038	18	17,999	3,961	28
Shropshire	38	57,932	48	73,418	15,495	26
Staffordshire	84	133,590	123	282,604	79,014	58
South Wales	72	182,325	113	277,643	95,318	28
SCOTLAND	22	24,500	27	37,500	13,000	—
NORTH WALES	7	13,100	12	25,000	12,000	—
Total	262	454,866	372	678,417	223,651	—

These must be regarded as estimated quantities.

From various statements Mr. Scrivenor† finds that—

	Tons.
In 1825 the make of pig iron in North Wales was	13,100
In 1826 " " "	15,756
In 1828 " " "	25,168
In 1830 " " "	25,000

The same return as the one above quoted informs us that—

	Tons of pig iron.
In 1825 there were 364 furnaces, 261 in blast, making	581,367
In 1828 " 367 " 277 "	703,184

* Comparative Statement, by F. Finch, 1831-2, made by order of the Government.

† Scrivenor, History of the Iron Manufacture.

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A.D. 1740 to 1830. The following statement will show the quantity of pig iron made in Great Britain from 1740 to the year 1830:—

Years.	Tons.
1740	17,350
1788	68,300
1796	125,079
1806	258,206
1825	581,367
1828	702,584
1830	678,417
Increase	661,067 tons.

Sir J. Guest, 1831. Mr. Porter,* quoting Sir John Guest, says, "the manufacture of iron remained stationary between 1823 and 1831, when it again began to advance." In the following year the estimate was 1,200,000 tons.

David Mushet, A.D. 1839. In 1839 we have the following return:—

——	Blast Furnaces.	In Blast.	Out.	Building.	Iron made.
					Tons.
South Wales	West of the Taffe, anthracite	23	3	11	65,780
Do.	East of the Taffe, bituminous	99	2	21	388,100
Gloucestershire	Forest of Dean	5	3	2	18,000
Shropshire	Colebrook, &c.	29	5	0	80,940
South Staffordshire	——	120	106	0	346,213
North Staffordshire	——	7	3	3	18,200
North Wales	——	13	7	0	33,800
Derbyshire	——	14	2	2	34,372
Yorkshire	——	24	5	0	52,416
Durham and Northumberland	——	5	—	—	13,000
Scotland	——	54	6	18	196,560
Do.	Charcoal furnace	1	0	0	400
Lancashire	Do.	2	0	0	800
		Total of Pig Iron			1,248,781

This table is given on the authority of David Mushet, who states that he himself made the survey; and in some cases he gives the actual make of each furnace.

A.D. 1840. G. R. Porter's Return. For 1840 Mr. Porter gives the following table:—

——	Tons made.	Tons coal used.
Forest of Dean	15,200	60,000
South Wales	505,000	1,436,000
North Wales	26,500	110,000
Northumberland	11,000	38,500
Yorkshire	56,000	306,500
Derbyshire	31,000	129,000
North Staffordshire	20,500	83,000
South Staffordshire	407,150	1,582,000
Shropshire	82,750	409,000
Scotland	241,000	723,000
	1,396,400	4,877,000
Coals used in converting to wrought iron		2,000,000
Total coal consumed in the make of iron in 1840		6,877,000

Iron Manufacture, A.D. 1842. In 1842, an association of the Yorkshire and Derbyshire iron masters caused the following estimate of the make of pig iron for six months to be published:

	Tons.
Yorkshire	23,471
Derbyshire	13,795
Staffordshire	151,130
Shropshire	40,643
South Wales	158,715
Scotland	135,460
Total	523,214

* Progress of the Nation, by G. R. Porter, F.R.S.

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Equal for the twelve months to 1,046,428, or, the make of other districts being added to this, 1,099,138. For about four years from 1840 great commercial depression prevailed, and the iron masters diminished the scale of their operations to lessen their losses. In 1844 the railways commenced operations on a large scale, and from a return made to Parliament in 1847 we find there were in that year—

A.D. 1847. Shipments.

Furnaces in blast	433
Furnaces out of blast	190
Pig iron made	1,999,608 tons.

In 1852 the make of iron had advanced to 2,701,000 tons.*

The quantity of coal used each year in the several branches of our iron manufacture may be estimated at not less than from 13 to 15 million tons.

In 1816 our total shipments COASTWISE and FOREIGN amounted to 4,145,909 tons; in 1840 they were 4,253,007 tons; in 1819 we find them 4,365,040 tons; in 1829, 6,224,125 tons; and in 1835, 6,854,053 tons.

Appendix, No. 58, p. 79. Appendix, No. 59, p. 80.

Our shipments to the British Colonies and Foreign Countries were in—

Appendix, No. 60, p. 80.

	Tons.
1816	237,657
1826	356,656
1836	916,868
1846	2,531,108
1850	3,351,880

After the 14th of August in that year the duties on coal exported were entirely repealed, and, as we shall see, a rapid increase in our exports immediately commenced.

A careful examination of the information brought together in this chapter leads us to the conclusion that in the fifty years under consideration there was a constant and steady increase in the production of coal from our coalfields. We have been compelled to seek for evidence of a collateral character, from which to make our computations. From this, the value of which everyone will be enabled to judge of, we infer that the mean average annual production of coal during the period under consideration would be not less than forty million tons. Therefore, in the first fifty years of the present century fully *two thousand millions* of coal would have been extracted from the coalfields of the United Kingdom. Adding to this the computation made at the end of our second chapter it may be safely asserted that to 1850 the coalfields of these islands had yielded 2,850,000,000 tons of coal. This is a quantity which is not readily appreciated, but it is more easily realised by assuming that a mass of coal equal to nearly three thousand million square yards of coal (a ton of coal is fairly represented by a square yard) had been drawn from our subterranean deposits; that, indeed, our coalfields had suffered to that extent of exhaustion.

CHAPTER IV.—THE PRODUCTION OF COAL FROM 1850 TO 1869.

It is thought that the facts connected with the production of coal in all the different coalfields of the United Kingdom within the last twenty years will be presented more satisfactorily by confining the statements of this chapter entirely to the quantities of coal raised, reserving for the next chapter the remarks in detail which it appears necessary to make on the peculiar conditions of the coalfields themselves, and the output of coal from them.

Even as recently as from 1850 to 1854, the most uncertain estimates respecting the quantities of coal raised were prevalent. The quantity of sea-borne coal was of course known from the returns regularly published by order of the House of Commons, but very little information was to be obtained respecting the inland traffic in coal, excepting such as was brought to London. Consequently those who wrote on the subject were obliged to satisfy themselves with the loose statements obtainable from various uncertain sources. The results given for those years are not consequently strictly reliable.

Estimates of coal produced.

The following are, however, the estimates usually given:

J. R. McCulloch, 1839.†

	Tons.
Domestic consumption and small manufactures	18,000,000
Iron making, general manufactures, railways, steam-boats, &c.	10,575,000
Exports to Ireland	1,000,000
Exports to colonies and foreign ports	1,449,417
Total	31,024,417

J. R. McCulloch, 1839.

1845.

J. R. McCulloch, 1845†	34,600,000

* Braithwaite Poole's Statistics of Commerce.

† J. R. MacCulloch, Commercial Dictionary. The several editions. Statistical Account, Vol. I., p. 599.

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J. R. McCulloch, 1855,

J. R. McCulloch, 1855—*

	Tons.
Domestic consumption and small manufactures	20,000,000
Production of pig and bar iron	15,000,000
Copper smelting, iron and brass manufacture	10,000,000
Cotton manufactures	1,000,000
Woollen, linen, silk ditto	1,000,000
Salt works, glass works	1,200,000
Lime works and brick works	1,500,000
Railway carriages, steam-boats	3,000,000
Home consumption	52,700,000
Exports to Ireland	1,200,000
Exports to colonies and foreign parts	4,300,000
Total of home and foreign consumption	58,200,000

De La Beche, 1839.

Henry T. De La Beche, 1839—†

Value of coal raised at pit's mouth	£ 9,000,000
Which may be considered as (waste coal included) representing about	36,000,000 tons.

J. E. Tennant, 1846.

James Emerson Tennant, 1846—‡

Value of coal raised at pit's mouth	£ 9,100,000
Representing, as above, about	36,400,000 tons.

B. Poole, 1852. Braithwaite Poole, 1852§ - - - - - 34,000,000 „

T. Y. Hall, 1854. T. Y. Hall, 1854‖ - - - - - 56,550,000 „

Ditto (quoting another authority)¶ - - - 52,000,000 „

J. Dickinson, 1853. Joseph Dickinson, 1853** - - - - 54,000,000 „

Mr. Dickinson, in the report quoted, gives a return which he says "I am enabled to furnish with a "very close approximation to accuracy."

From this it appears "the output of coals" in 1852 was as follows:

	Tons.
In Lancashire	8,255,000
In Cheshire	715,000
In North Wales	953,000
Total of those districts	9,923,000

These returns are given as from 679 *pits* in Lancashire, 50 *pits* in Cheshire, and 150 *pits* in North Wales.†† The collieries in Lancashire, Cheshire, and North Wales were reported in 1853 to be 423.‡‡

* J. R. McCulloch, Commercial Dictionary. The several editions. Statistical Account, vol. I., p. 599.

† Report on the Geology of Cornwall, Devon, and West Somerset, by Henry T. De La Beche, F.R.S., Director of the Ordnance Geological Survey, 1839.

‡ Quoted by R. C. Taylor, Statistics of Coal, 1848.

§ Statistics of British Commerce, by Braithwaite Poole, 1852.

‖ A treatise on the extent and probable duration of the Northern coalfield, by T. Young Hall.

¶ A treatise, quoting "a particularly careful writer on the subject of the Coal Trade."

** Reports of Inspectors of Coal Mines, 1853.

†† In a previous Report, Mr. Dickinson gives the following as the number of collieries under his inspection in 1851:—

Staffordshire	250
Shropshire	50
Worcestershire	60
Cheshire	20
Lancashire	300
Denbighshire, Flintshire	55
Anglesea	5
	740

comprising on an average about four pits to each colliery, and producing about 22,000,000 tons of coal per annum.

Mr. Dickinson remarks, "The collieries of Staffordshire, Shropshire, and Worcestershire are familiarly known by their "association with the iron trade. Those in Cheshire and Lancashire are similarly extensive, and afford the supply of coal to the "populous manufacturing districts in which they are situated. Those in Denbighshire and a part of Flintshire have been hitherto "secluded, but have now obtained railway communication, and are assuming an increased importance; whilst those in Anglesea "are small, and occupy a very obscure rank in the district with which they are associated."

‡‡ These were in their respective districts as follows:—

		Number of Collieries.	
Lancashire,	Ashton-under-Lyne	7	
	Blackburn	21	
	Bolton	43	
	Burnley	14	
	Bury	11	
	Chorley	7	
	Leigh	15	
	Manchester	15	
	Oldham	28	
	Rainford	10	
	Rochdale, including Bacup and Rossendale	84	
	St. Helen's	25	
	Wigan	24	
			334
Cheshire			28
North Wales,	Anglesea	5	
	Flintshire	30	
	Denbighshire	26	
			61
	Total collieries		423

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We have remarked elsewhere on the importance of distinguishing between *pits* and collieries; one colliery may comprehend many pits.

The same authority thus summarises the total production of coal in 1851 and 1852, stating, however, that the quantities must be regarded as approximate only, since the available information is of a very uncertain character: J. Dickinson, 1852.

	Tons.
Northumberland, Durham, and Cumberland	11,000,000
Lancashire, Cheshire, and North Wales	10,000,000
Staffordshire, Shropshire, and Worcestershire	8,000,000
Yorkshire, Derbyshire, Warwickshire, Leicestershire, and Nottinghamshire	7,500,000
South Wales, Monmouthshire, Gloucestershire, and Somersetshire	10,000,000
Scotland	7,500,000
Total of coal raised per annum	54,000,000

Mr. Robert Williams in 1854 gave as the nearest approximation he could make the total product of coal in Scotland as 7,448,000 tons. R. Williams, Scotland, 1854.

It is important that the value of those estimates should be carefully considered, since they have been employed, as it appears to us, without sufficient consideration, in computing the annual increase in the consumption of our coal.

In the Appendix will be found a table giving the coals brought to London by canal from 1805 to 1852, and continued on to the end of 1869. Appendix, Table No. 41, p. 63. A.D. 1851 to 1853.

In each of the first three years the coal brought by canal to London amounted to the following weights.

	Tons.
1851 brought by Inland Navigation past the city's boundary at Grove Park, &c.	24,206
1852 do. do. do.	33,800
1853 do. do. do.	21,644

Whilst the following railways brought into London: Railways, 1851 to 1853.

Names of Railways.	1851.	1852.	1853.
	Tons.	Tons.	Tons.
Great Northern	101,976	195,865	358,775*
London and North-western	110,163	137,978	173,346
Eastern Counties	5,296	28,815	68,148
Great Western	25,152	4,596	16,589
South Eastern	5,319	10,652	12,851
Total	247,906	377,906	629,709

The existing information respecting the inland traffic in coal about this period is very limited, and the above is nearly all that we have been enabled to obtain.

Of the evidence at our command for the years 1851 to 1853 inclusive, one division is strictly reliable, the exports Coastwise and to Foreign parts, while another division, viz., the inland distribution of the coal, is of an uncertain character. Exportations, 1851 to 1853.

	Tons.
In 1851 exports from Durham and Northumberland coalfield	7,887,806
1852 do. do. do.	8,280,883
1853 do. do. do.	8,268,129
In 1851 exports from Cumberland coalfield	528,697
1852 do. do.	541,853
1853 do. do.	617,168
In 1851 exports from Lancashire and Cheshire coalfield	536,190
1852 do. do. do.	524,773
1853 do. do. do.	592,862
In 1851 exports from Yorkshire coalfield	191,965
1852 do. do.	165,850
1853 do. do.	150,200

* Great Northern Railway.

The following Statement of the Quantity of Coals brought into the London District by the Great Northern Railway, from August 1850 to 31st March 1853, varies from that given in the text, owing to the different periods taken for the Return :(1)

Period.	Weight.			
	Tons.	cwts.	qrs.	lbs.
From August 1850 (the date at which the Great Northern line was opened to London) to 31st December 1850	2,775	0	0	0
During the year 1851	97,159	0	0	0
During the year 1852	197,495	0	0	0
From the 18th January to 31st March 1853	88,919	0	0	0
Total tons carried	386,348	0	0	0

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	Tons.
In 1851 exports from Somerset and Gloucester coalfield - -	97,820
1852 do. do. do. - -	100,279
1853 do. do. do. - - -	102,695
In 1851 exports from South Wales coalfield - -	2,025,998
1852 do. do. - - - - -	2,110,390
1853 do. do. - - - -	2,499,734
In 1851 exports from Scotch coalfield - - - - -	891,073
1852 do. do. - - - - -	820,644
1853 do. do. - - - -	854,387*

In addition to the above returns, considerable quantities of coals were shipped from ports distant from the coalfields. It is therefore necessary that the total exports should appear in close proximity with those.

The shipments from all the ports of the United Kingdom were for those three years as follows:

Years.	Coastwise.	Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	8,816,538	3,468,545	12,285,083
1852	9,069,577	3,640,194	12,709,771
1853	9,070,984	3,935,062	13,006,046

The coal taken into Manchester by road, rail, and canal from the Lancashire and Cheshire collieries was in—

	Tons.
1851 - - - - -	1,241,854
1852 - - - -	1,436,058
1853 - - - - -	1,221,272

The total consumption of coal in Manchester and Salford being estimated by a competent authority as being in those years 2,000,000 tons.†

The rate of increase in the consumption of coal in a large town is shown by these figures, compared with some returns made to the Statistical Society of Manchester in 1837. From this document we learn that in 1834 737,008 tons were brought into Manchester by the road, rail, and canal, and that in 1836 the canals brought in 570,628 tons, and the Liverpool Railway and the road 343,363, equal together to 913,991 tons.

Appendix Table, No. 55, p. 77.

The return already given appears to show that less than ten million tons were produced from the coalfields of Lancashire, Cheshire, and North Wales at this time.

The Taff Vale returns, which have been kept with great care since the opening of that railway, show that in 1851 there were 612,716 tons of coal and coke conveyed over that line, in 1852 711,962 tons, and in 1853 874,362 tons; of this the retail sales were in 1851 66,260 tons, in 1852 104,722 tons, and in 1853 169,860 tons.

See page 144.

In 1843 the Coventry canal, we learn from returns obligingly furnished by the Canal Company, carried from the Cannock or Staffordshire coalfield 33,917 tons, from the Warwickshire coalfield 95,100 tons, and from the Leicester coalfield 64,250 tons.

See page 120.

In 1849 this canal carried from the Staffordshire coalfield 11,470 tons, from Warwickshire 87,630, and from the Leicestershire district 81,150 tons. The details of this will be found in the Appendix in connection with a table showing the more recent distribution of the coal from those counties.

The Erewash Valley carried by railway and canal in 1851 586,001 tons, in 1852 632,587 tons, and in 1853 818,369 tons from the Midland collieries touched by their system.

Appendix, Table No. 90, p. 91.

Since the quantity of coal used in the smelting and manufacturing of iron forms a very large proportion of all the coal raised, we may by learning the quantity of iron made form an estimate from it of the state of the coal trade at the period.

The quantity of coal used in 1854 in the manufacture of crude and malleable iron is given by Mr. Truran as 20,146,000 tons for the United Kingdom; the make of pig iron in that year being given by the same authority at 3,585,906 tons.‡ In 1848, Mr. McCulloch gives the make of pig iron as 2,008,200 tons, but he adds, "We are, however, inclined to think that some of the English returns " in the above table are exaggerated, and that the make in 1848 may be estimated at about 1,850,000 " tons." McCulloch further remarks, "Taking the annual produce of pig iron in the United Kingdom " at 1,900,000 tons, and supposing about 3½ tons of coal are required for the production of each ton of " iron, the consumption of coal in this branch of the iron trade will, on this hypothesis, amount to " 6,650,000 tons, and adding to this quantity 4,000,000 tons for the coal required for the conversion

* Although the above figures are given for coals sent from the coalfields named—as it is possible that some of the coal may have been derived from adjoining coalfields—it is thought advisable to give the ports of shipment in each case :—

1. DURHAM AND NORTHUMBERLAND.—Newcastle, Sunderland, Stockton, Hartlepool, North Shields.
2. CUMBERLAND.—Whitehaven, Maryport, Workington.
3. LANCASHIRE AND CHESHIRE.—Liverpool, Preston, Fleetwood, Lancaster, Chester, WALES, and some YORKSHIRE.
4. YORKSHIRE.—Hull, Goole, Grimsby.
5. SOMERSET AND GLOUCESTER.—Bristol, Gloucester.
6. SOUTH WALES.—Newport, Swansea, Cardiff, Port Talbot, Neath, Port Cawl, Llanelly, Milford.
7. SCOTLAND.—Glasgow, Gainsborough, Irvine, Ayr, Greenock, Grangemouth, Borrowstoness, Kirkaldy, Leith, Dundee, Alloa.

(1) Extract from Report from the Select Committee on Coal Duties (Metropolis), August 12th, 1853, page 219.

† See a Paper, "Statistics of the collieries of Lancashire, Cheshire, and North Wales," published in the Transactions of the Philosophical Society of Manchester, by Mr. J. Dickinson.

‡ The Iron Manufacture of Great Britain Theoretically and Practically considered. By William Truran, C.E., 1855.

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" of pig iron into bar iron, it follows that a supply of no fewer than 10,650,000 tons of coal will be " annually required in this simple department of industry."*

We believe Mr. McCulloch has understated the quantity; whereas Mr. Truran has evidently erred as much in excess. It should be noted here that the make of pig iron in 1854 was given by the Keeper of Mining Records, who made very careful inquiries at the time, as 3,069,838 tons or nearly 500,000 tons less than the quantity given by Mr. Truran. Make of iron, 1854.

From these and several other direct and collateral sources of information, we believe the average production of coal in each of the three years 1851, 1852, 1853, may be taken as follows:

	Tons.
Coals shipped from all ports both of the coast and foreign	12,700,000
Used in iron manufacture	15,000,000
Brought to London by rail and canal	425,000
Consumed in general manufactures for producing steam, &c.	12,750,000
Consumed for domestic purposes	10,000,000
Total	50,875,000

In 1853, Sir Charles Trevelyan and Sir Stafford Northcote were appointed by the Treasury to examine into the working of all the offices connected with the Museum of Practical Geology, then under the direction of Sir Henry De La Beche. They reported that "The Mining Record Office is an interesting and valuable department of the institution;" and then, after stating what had been done, they continue, "But the produce of iron, coal, and some other important mineral substances has not " been ascertained, nor can the department be expected to obtain it, with any accuracy, unless it is " enabled to make systematic inquiries, by sending officers of its own to collect and organise in- " formation;" again they write, "Before quitting the subject of Mining Records, we have to suggest " that the information which is collected as to the produce of the mines should be regularly com- " municated to the Statistical Department of the Board of Trade. We have also to recommend that " the Keeper of Mining Records should be placed in communication with the inspectors of coal mines, " who might materially assist him in his inquiries respecting mines of that description."† The collection and publication of "MINERAL STATISTICS," 1854.

The result of this was, that arrangements were made for carrying out the recommendation of the Committee, and in July 1855 the first return of coal produce and iron manufacture obtained by direct application to the coal owners and iron masters was published. Since that period, the "Mineral Statistics of the United Kingdom"‡ give, with all possible exactness, the quantities of coal raised from our collieries in each year. It should, however, be distinctly understood, that the earlier years are less exact than the more recent ones. When the experiment was first made there was with many men considerable doubt as to the object of the inquiry, and while some objected to give returns at all, and others hesitated; many gave returns which were not strictly reliable, being rather the averages of the production of the colliery for several years than the actual return of the year for which it was required.

From 1854 to the present time, therefore, the returns of the production of our collieries is given on this authority.

TOTAL NUMBER of COLLIERIES in the UNITED KINGDOM in each year, from 1854 to the end of 1870.

Appendix, Table No. 61, p. 81.

Years.	England.	Wales.	Scotland.	Ireland.
1854	1,824	259	368	There are about 69 collieries; but of these not more than 40 appear to have been working in any one year.
1855	2,043	277	403	
1856	2,031	320	405	
1857	2,082	340	425	
1858	2,090	360	417	
1859	2,094	369	413	
1860	2,113	383	427	
1861	2,164	391	426	
1862	2,189	407	448	
1863	2,207	427	482	
1864	2,284	414	497	
1865	2,293	456	497	
1866	2,235	434	491	
1867	2,316	424	483	
1868	2,268	364	433	
1869	2,027	380	412	
1870	*Return not complete.*			

The above list must not be received as representing accurately the number of collieries at work in any given year. There exist two or three sources of error which it is our duty to point out. In the first place, a considerable number of small collieries are opened and closed, according to the conditions of

* A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation. By J. R. McCulloch, Esq., 1856.
† Reports of committees of Inquiry into Public Offices. Report on Department of Practical Science and Art, May 25th, 1853.
‡ Mineral Statistics of the United Kingdom of Great Britain and Ireland for 1853 and 1854, by Robert Hunt, F.R.S., Keeper of Mining Records. Published by order of the Lords Commissioners of Her Majesty's Treasury. Continued each year.

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trade, or the necessities of the owner, within very short periods, without the fact becoming known to the Colliery Inspectors, to whom we are indebted for the lists, as given more in detail in the Appendix. Collieries again, in changing proprietors, are suspended for some months. Another cause of irregularity is, the difficulty of defining a colliery. In some cases a number of *pits* are returned as one colliery; in other cases, each *pit* is given as a separate colliery. The numbers given are, however, sufficiently consistent with each other to represent the changes which have taken place over a period of years. We find, for example, the following differences in the number of the collieries in 1858 and 1868.

Appendix, Table No. 61, p. 81.

	1858.	1868.
England	2,090	2,268
Wales	360	364
Scotland	417	433
Ireland	40	40
Total	2,907	3,105

The increase being 198 collieries in the ten years.

A detailed statement of all the collieries, arranged in regard to the inspectors districts, will be found in the Appendix, with their situation and the names of the owners.

Appendix, Table No. 27, p. 17.

The production of coal in the UNITED KINGDOM since 1854 has been as follows:—

Appendix, Table No. 62, p. 82.

Years.	——	Increase.	Decrease.
	Tons.	Tons.	Tons.
1854	64,661,401	—	—
1855	64,453,070	—	208,322
1856	66,645,450	2,192,371	—
1857	65,394,707	—	1,250,743
1858	65,008,649	—	386,058
1859	71,979,765	6,971,116	—
1860	84,042,698	6,062,933	—
1861	86,039,214	1,996,516	—
1862	81,638,338	—	4,400,876
1863	86,292,215	4,653,877	—
1864	92,787,873	6,495,658	—
1865	98,150,587	5,362,714	—
1866	101,630,544	3,479,957	—
1867	104,500,480	2,869,936	—
1868	103,141,157	—	1,359,323
1869	107,427,557	4,286,400	—
1870	Return not complete.		

	Tons.
The increase in the five years to 1859	7,318,364
" " " 1864	20,610,108
" " " 1869	14,639,684

Or we have an increase in ten years, that is, from 1859 to 1869, of 35,447,792 tons.

For the present those figures must be allowed to speak for themselves.

The quantity of coal produced in the years from 1854 to 1869, both inclusive, amounts to 1,343,793,705 tons, which added to the quantity given at the end of the last chapter, namely, 2,850,000,000 tons, shows that up to the end of last year, estimating the return for 1870 at 110,000,000 tons, we shall have drawn from our original stores of fuel not less than *four thousand three hundred millions of tons of coal.*

CHAPTER V.—OUR COALFIELDS AND THE DISTRIBUTION OF THE COAL.

DURHAM and NORTHUMBERLAND.

Extending along our eastern coast, from the mouth of the Tees on the south to the mouth of the Coquet on the north, a distance of about 50 miles, is the great northern coalfield of Durham and Northumberland. Its width varies considerably. A line drawn westward from Hartlepool gives a width of 24 miles, a line drawn through Durham 21 miles, a line through Newcastle 18 miles, a line from the mouth of the Blyth 6 miles, about the same width across Morpeth, and from near the mouth of the Coquet but a little more than one mile.

The seams of coal which are principally worked in this district are the High Main seam, the Bensham seam, the Five Quarter Main seam, the Hutton seam, Beaumont seam, Low Five Quarter, Three

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Quarter seam, Brockwell, and Stone Coal. These seams are known by other names,* each district usually adopting its own peculiar term to designate the workable coal seams: thus, the Bensham seam of the Tyne is known as the Maudlin seam of the Wear; the Beaumont or Harvey seam is the Townley seam of the Townley Colliery, and the Main Coal of the Wylam Colliery. At Hetton the High Main seam of the Crumlington district separates into two, and is called the Three Quarter seam at Pontop; where it unites again it is known as the Shieldrom seam. The Crumlington Grey seam is the Metal Coal seam and Stone Coal seam of Sheriff Hill, where it is divided; while it unites at Hetton and forms the Five Quarter seam of that and the Auckland district. The Crumlington Yard seam becomes the Main Coal seam at Hetton, Haswell, and some other localities; the Brass Hill at Pontop, and the Main Coal in Auckland. Again, the Crumlington Five Quarter seam divides and forms the Six Quarter and the Five Quarter at Sheriff Hill, and the Brass Hill seam at Pittington; they again unite and form the Hutton seam at Pontop Colliery, and so with regard to a few others.†

To the westward of Newcastle there are some smaller workings for coal in the Acomb township, and near Fallowfield. Near Hexham six collieries are worked, and three near Haltwhistle.‡

Adopting the divisions into inspector's districts, as settled by the Secretary of State for the Home Department, the numbers of the collieries in Durham and Northumberland will be as follows:— See Appendix, List No. 27, p. 17.

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* Mr. Hull gives the following for the Newcastle district:—

	Thickness. Ft.	In.
1. High Main coal	6	0
2. Metal coal	1	6
3. Stone coal	1	6
4. Yard coal	2	10
5. Bensham coal	2	10
6. Five Quarter coal	3	0
7. Low Main coal	6	0
8. Crow coal	2	10
9. Five Quarter coal	3	8
10. Ruler coal	1	10
11. Townley or Harvey coal	3	1
12. Jelly coal	2	2
13. Stone coal	2	
14. Five Quarter coal	3	4
15. Three Quarter coal	2	6
16. Brockwell coal	2	11*

* The Coalfields of Great Britain, their History, Structure, and Duration. By Edward Hull, B.A., F.R.S. London, 1861, 1st Edition. London, 1861, 2nd Edition.

† The following synopsis of the coal seams of this coalfield is given by William Oliver, in his "Sections of the Coal Measures of Northumberland and Durham":

Seghill District.	Wallbottle District.	Wallsend District.	Sherriff Hill District.	Hetton District.	Pontop District.	Auckland District.
High Main		High Main	High Main	Three Quarter	Shield Row	Three Quarter.
Grey Seam		Metal Coal Stone Coal	Metal Coal Stone Coal	Five Quarter	Five Quarter.	
Yard Coal		Yard Coal	Yard Coal	Main Coal	Brass Hill	Main Coal.
Bensham		Bensham	Bensham	Maudlin	Hutton	Surtees.
Five Quarter		Six Quarter Five Quarter	Six Quarter Five Quarter	Low Main		
Low Main	Gronee	Low Main	Low Main	Hutton	Main Coal.	
Beaumont	Engine	Beaumont	Beaumont	Harvey	Busty Bank.	
Brockwell	Splint	Brockwell	Brockwell	Brockwell	Brockwell	Brockwell.

‡ The following information has been obligingly furnished by Mr. Walton of Alston Moor:—

Acomb township contains about 2,900 acres, and the seam of coal known as the Fallowfield seam lays in the whole of it. There has been wrought near the Half-way House about 60 acres, near the Garden House about 140 acres, near the Mines, say about 10 acres; total about 210 acres, leaving about 2,690 acres unwrought.

Probably one fourth of this may be affected by veins, troubles, &c., so as to be valueless as fuel, leaving about 2,000 acres of coal yet to work; and as this seam varies from about six to two feet in thickness, probably four feet thick may be considered an average; and as one acre of coal one foot thick produces about 1,510 tons of coals, consequently 1,510 × 4 × 2,000 = 12,080,000 tons unwrought; this will lay from about 20 to 100 fathoms beneath the surface. There is also an upper seam, called the Oakwood seam, 1½ feet thick; about 500 acres of this is unwrought, which would produce about 1,020,000 tons, making 13,100,000 tons of coals yet to work in Acomb township.

Fallowfield township contains 670 acres, of this about 370 acres have been wrought, leaving about 300 acres or about 1½ millions of tons yet to work. The upper seam is not on in this township.

Wall township, about 100 acres unwrought, equal to about half a million tons.

Anick and Anick Grange contain about 1,000 acres. The Fallowfield seam has not been wrought in these townships, which ought to yield about six millions of tons. The upper seam has been partially wrought in these townships.

Sandhoe contains about 1,500 acres, and should yield about nine millions of tons.

It is every way probable that a considerable quantity of coal is laying in the adjoining parishes of Hexham and Corbridge at a greater depth from the surface.

This seam has been wrought a little eastward at Fenwick, near Matfen, and westward at Fourstones, Brokenheugh, Whinney, Birkshaw, Whitechapel, Barcome, Haltwhistle, and Green Head, where it is found near the surface, all the way on the north side of the south branch of the river Tyne, and is generally thinner than at Acomb, Fallowfield, and Fourstones; probably not more than 5 per cent. of the coal is wrought that could be wrought to pay at the present price of coal, and with the present contrivances for working.

This seam has not been wrought on the south side of the Tyne, in consequence of its dipping under the bed of that river and being deeper from the surface.

The stratification rises northward, where several other seams of coal crop out to the surface, some of inferior quality, containing a considerable portion of iron, and some of good quality, such as Ginnerton and Cowden, Hareshaw Head, and High Green collieries, on the north branch of the Tyne river.

I have no means of knowing what quantities have been wrought at those collieries, but believe it will amount to a very small quantity compared with the whole.

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The inspection district of Mr. GEORGE W. SOUTHERN embraces Northumberland and the northern divisions of Durham.

The Seasale Collieries are in the district of Tyne, Blyth, and Coquet	90
The Landsale Collieries around Newcastle and Gateshead, Berwick and Morpeth, Prudhoe, Hexham, and Haltwhistle	54

The inspection district of the late Mr. JOHN J. ATKINSON, now that of Mr. JAMES WILLIS, embraces the following collieries:—

In the district of Tyne	26
,, Wear and Seaham	34
,, Tees, Hartlepool, and Stockton	93
Landsale Collieries	8

From these collieries the quantities of coal produced in each year since 1854 have been about those given in the following table:—

See Appendix, Table No. 62, p. 82.

1854	15,420,615
1855	15,431,400
1856	15,492,969
1857	15,826,525
1858	15,853,484*
1859	16,001,125*
1860	18,244,708†
1861	19,144,965
1862	19,360,356‡

* The Tyne Commissioners' Report gives the coal exported from the Tyne as being in 1859 4,407,225 tons, and in 1858 as 4,018,990, showing an increase of 388,235 tons. From the abstract of the Treasurers' Account with the Commissioners for regulating the loading of ships in the port of Newcastle-on-Tyne, from the 1st January to the 31st December 1859, we have the following:—

	Keels.	£	s.	d.
January, cash received at ½ per keel	17,272	35	19	8
February ,, ,,	12,890	26	17	1
March ,, ,,	13,502	28	2	7
April ,, ,,	17,145	35	14	6
May ,, ,,	17,128	35	13	8
June ,, ,,	16,610	34	12	1
July ,, ,,	20,458	42	12	5
August ,, ,,	19,986	41	11	11
September ,, ,,	18,574	38	13	11
October ,, ,,	20,258	42	4	1
November ,, ,,	17,038	35	9	11
December ,, ,,	17,044	35	10	2
Total	207,888	433	2	0

The measure of the keel is 8 Newcastle chaldrons of 53 cwt. each. 207,888 keels = 4,407,225 tons.

† From the Report made to the coal trade of Newcastle in December 1860 the following statement of the trade in that year is extracted:—

	Tons.
Shipped to London from October 1859 to October 1860 inclusive	3,392,005
Shipped to London from October 1858 to October 1859 inclusive	3,069,944
Showing an increase of	322,061

During the whole year 1860 the shipments to London, as registered at the office of the Clerk and Registrar of the Coal Market, were as follows:—

	Tons.
From Newcastle	1,347,574
,, Seaham	210,418
,, Sunderland	977,519
,, Middlesbro'	61,183
,, Hartlepool and West Hartlepool	703,836
,, Blyth	40,986
Total	3,341,516
Shipped coastwise from October 1859 to October 1860 inclusive	3,039,759
Shipped coastwise from October 1858 to October 1859 inclusive	2,770,543
Showing an increase of	269,216

During the year 1860 the total shipments coastwise were:

	Tons.
Coals	6,338,506
Coke, computed as coals	43,090
Total	6,381,596
Of these London received	3,341,516
There were therefore sent to other ports	3,040,080
Exported to foreign ports from October 1859 to October 1860 inclusive	3,702,904
Exported to foreign ports from October 1858 to October 1859 inclusive	3,651,468
Showing an increase of	51,436

During the year the exports to foreign ports were:

	Tons.
Coals	3,787,235
Coke, computed as coals	426,954
Total	4,214,189

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A.D. 1863 to 1869.

1863	22,154,146
1864	23,284,367
1865	25,032,694
1866	25,194,550
1867	24,867,444
1868	24,394,167
1869	25,765,430

1870 returns incomplete.

In the 19 years ending 1869 the shipments from the northern ports were as follows:—

SUMMARY of COAL SHIPMENTS from the DURHAM and NORTHUMBERLAND COALFIELD from 1851 to 1869, both inclusive. Appendix, Tables No. 63 to 69, p. 83.

A.D. 1851 to 1869.

—	Newcastle Shipments.	Sunderland Shipments.	Hartlepool Shipments.	Stockton Shipments.	North Shields Shipments.	South Shields Shipments.	Middlesboro' Shipments.	Total Shipments.	Increase over previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	36,861,881	28,223,184	17,315,773	3,281,307	3,895,599	—	—	89,577,744	20,202,344
1861 to 1869	42,747,519	31,427,462	15,140,300	17,669	3,541,923	524,602	2,464,684	95,864,159	6,286,415
Total	79,609,400	59,650,646	32,456,073	3,298,976	7,437,522	524,602	2,464,684	185,441,903	26,488,759

In the Appendix will be found a table in which we have carefully summarized the shipments of coal from those northern ports since 1801. The total shipments in each of the ten years were as follows:— Appendix, Table No. 70, p. 84.

	Tons.	Increase.
From 1801 to 1810	23,859,428	—
„ 1811 „ 1820	28,247,739	4,388,311
„ 1821 „ 1830	34,287,940	6,040,201
„ 1831 „ 1840	45,888,254	11,600,314
„ 1841 „ 1850	69,375,400	23,487,146
„ 1851 „ 1860	89,577,744	20,202,344
„ 1861 „ 1868	85,332,673	—

This last return is for eight years only. In 1869 the total exports from the ports in question were above ten million tons; and if we estimate those of 1870 at about the same quantity, we shall have an increase in the ten years to 1870 of 16,817,963 tons.

The produce of coal in Durham and Northumberland for 1862 was given as follows in a report on "Coal, Coke, and Coal Mining," by Messrs. N. Wood, John Taylor, John Marley, and J. W. Pease, to the British Association at Newcastle in 1863:— Produce 1862.

	Tons.
House coal	4,493,450
Gas coal	1,717,000
Steam coal, small and manufacturing coal	4,317,120
Distributed on Carlisle line	120,000
Coke consumed in iron trade	5,000,000
Alkali and other manufactures	1,250,000
Colliery and home consumption	2,200,000
Duff and waste	500,000
Total	21,777,570

The excess in this statement over that given in the "Mineral Statistics" arises from the difference in the estimates given of the last four items. In the "Mineral Statistics" these were given as follows:—

Coals and coke used in iron works	1,970,500 tons.
Colliery consumption	1,850,000 „
Immediate local consumption for general purposes and manufactures	1,520,500 „

There was evidently an error in computing the coal used for iron making. The pig iron made was 824,431, and supposing three tons were used for all purposes, which is a very high computation, it

The increase of shipments for the year ending October 1860 were:

Shipped for London	322,061
„ coastwise	269,216
„ for foreign ports	51,436
Total increase of shipments from October 1859 to October 1860	642,713

The increase of shipments for the year ending 31st December 1860:

Coals sent coastwise and from foreign parts in 1860	10,595,785
„ „ „ 1859	10,295,490
	300,295

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would only amount to 2,473,294 tons. An attempt was made for two years to arrive at some correct result as to "duff and waste," but the returns were so unreliable, and varied so greatly, that it was abandoned. Of late years, however, a large economy has been effected in this direction.

Shipments from 1851.

In the ten years ending 1860 the shipments from the ports of the Tyne, Wear, and Tees were as follows:—

——	Coastwise.	Foreign.
	Tons.	Tons.
Newcastle - -	20,980,061	15,881,820
Sunderland - - -	20,843,128	7,380,056
Stockton - -	2,287,623	993,684
Hartlepool - - -	12,544,493	4,771,280
North Shields - -	1,703,633	2,191,966
Total -	58,358,938	31,218,806

Shipments from 1860.

While in the nine years ending 1869 they were as follows:—

——	Coastwise.	Foreign.
	Tons.	Tons.
Newcastle - -	21,220,665	21,526,854
Sunderland - - -	20,981,532	10,445,930
Stockton - -	7,423	10,246
Middlesborough - -	1,422,653	1,042,031
Hartlepool - -	9,598,713	5,541,587
North Shields - -	1,045,553	2,496,370
South Shields - -	84,869	439,733
Total -	54,361,408	41,502,751

This shows that there was a decrease in the coal carried coastwise to the extent of 3,997,530 tons, which may be referred to the interference of the railways; but in the foreign shipments there was an increase of 10,283,945 tons between the total quantities of the first ten years and the last nine years, or a total increase of the coal sent from our great northern coalfield of 6,286,415 tons.

RAILWAY DISTRIBUTION of COAL and COKE from the DURHAM and NORTHUMBERLAND COALFIELD.

RAILWAYS.

The distribution of coal by railway cannot be obtained with the same accuracy or in such detail as the shipments of coal. The railway companies carrying coal have, at a considerable expenditure of time, furnished this Committee with very detailed statements of their coal traffic for certain years. They could not be asked to do this for several years. We believe, however, that the returns given show with quite sufficient clearness the distribution of coal over the country by the railways.

North-eastern Railway. See Appendix, Table 71, p. 85.

The NORTH-EASTERN RAILWAY carried from the great northern coalfield the following quantities in each of the years from 1859 to 1869:—

	Tons.
1859 - - - -	2,718,599
1860 - - - -	2,575,303
1861 - - - -	2,650,430
1862 - - - -	2,826,590
1863 - - - -	4,866,393
1864 - - - -	5,744,501
1865 - - - -	7,069,556
1867 - - - -	7,504,152
1868 - - - -	7,357,266
1869 - - - -	8,280,310

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Mr. Salt furnishes a return for an earlier period, 1844, for that year only, from which it appears that 130,930 tons were then carried between York and Darlington.

The Maryport and Carlisle Railway gives the following return of coal received by them off the North-Eastern Railway at Carlisle, (being chiefly sent from the Newcastle and Durham Districts):—

	Tons.
For the year 1867	24,018
For the year 1868	17,892
Total	41,910

Great Northern Railway, 1866.

THE GREAT NORTHERN RAILWAY received from the Durham Pits in the year 1866 the following quantities of coal and coke; as these are given together it is not possible to determine the quantity of either separately:—

		Tons.
Distributed to stations on the main line		160,975
Ditto on the Loop Line		9,166
Ditto	East Lincolnshire	4,182
Ditto	Hatfield and St. Alban's	104
Ditto	Hertford, Luton, and Dunstable	788
Ditto	Royston and Hitchin	1,479
Ditto	Bedford and Cambridge	724
Ditto	Ramsay Branch	141
Ditto	Ryhale and Stamford	188
Ditto	Bourne and Essendine	75
Ditto	Nottingham and Grantham	39
Ditto	Boston and Sleaford	839
Ditto	Bourn and Lynn	1,669
Ditto	Horncastle Branch	395
	Total	180,764

The following quantities of coal and coke were conveyed to stations on the Great Northern line for further transit by other railway companies:—

	Tons.
Brought to Peterboro' for the GREAT EASTERN RAILWAY	196,900
Brought to London for the LONDON BRIGHTON AND SOUTH COAST RAILWAY	17,118
Brought to London for the LONDON CHATHAM AND DOVER RAILWAY	10,789
Brought to London for the NORTH AND SOUTH WESTERN JUNCTION RAILWAY	7,430
Brought to London for the NORTH LONDON RAILWAY	17,087
Brought to London to Kew Junction for the LONDON AND SOUTH-WESTERN RAILWAY.	44,996
The total quantity carried by the GREAT NORTHERN RAILWAY	475,084

The Great Northern Railway also received the following quantities, and distributed them between the stations named:—

	1867.	1868.	1869.
	Tons.	Tons.	Tons.
Between London and Hatfield, both included	271,069	241,557	294,511
Between Welwyn and Peterborough, both included	197,821	199,463	191,142
Between Tallington and Arksey, both included	2,119	872	790
Between Doncaster and Gainsborough	6	—	—
Between Peakirk and Lea, both included	9,452	10,130	17,980
East Lincolnshire	4,899	4,228	4,714
Total Tonnage	485,366	456,250	509,137

Of this tonnage the following quantities were passed to other lines:—

	Tons.	Tons.	Tons.
To the GREAT EASTERN *viâ* Peterboro'	189,030	183,241	180,810
To ditto *viâ* Spalding			8,858
To other railways *viâ* King's Cross	104,522	71,243	89,015

London and North Western Railway, 1868.

The LONDON and NORTH WESTERN RAILWAY received from the North Eastern Railway the following quantities of Durham coal during the year 1868:—

	Tons.
At Stations between Preston and Carlisle	29,583
Ditto east of Warrington to Manchester	34
Ditto between Manchester and Leeds	2,329
Ditto between Birmingham and Rugby	6
Ditto on the Bletchly and Cambridge branch	19
Ditto between Rugby and London, excluding both	39
Total	32,010

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South Durham Railway.

This Railway also received from the South Durham Railway:—

	Tons.
At stations between Preston and Carlisle	79,964
Ditto between Preston and Warrington, including both	947
Ditto west of Warrington to Liverpool, including Liverpool	632
Ditto East of Warrington to Manchester, including Manchester	6
Ditto on Buxton and Macclesfield branches	39
Birkenhead and Chester	97
At stations between Crew and Shrewsbury, including Shrewsbury	10
Ditto between Rugby and London, excluding both	8
London and North Western stations between Whitehaven and Cockermouth	16,918
Total	98,621

Midland Railway.

The Midland Railway received from the North Eastern Railway 82,641 tons of coal from the Durham Coalfield. Of this the quantity distributed between

	Tons.
Shipton and Leeds is	4,053
Masboro' and Clay Cross is	4,177
Derby and Hampton is	39,522
Birmingham and Redditch is	6,306
Broomsgrove and Worcester is	696
Nottingham and Lincoln is	605
Mansfield and Lenton is	2,155
Pye Bridge and Loughboro' is	2,406
Melton and Stamford is	10
Market Harboro' and Hitchim is	724
Sheffield receives	20,160
Gloucester „	180
Alfreton „	36
Leicester „	893
Nuneaton „	19
Rugby „	692
Kembolton „	7
Total	82,641

This coal is not carried by this line farther north than Shipton; farther west than Gloucester; nor farther south nor east than Hitchin.

Blyth and Tyne Railway. Particulars of coal led over this railway for the year ending 31st December 1869:—

	Large Coal.	Small Coal.
	Chaldrons.	Chaldrons.
Carried to and shipped at Tyne	421,710	111,289*
„ „ Blyth	84,976	5,505
Carried to Morpeth for shipment on the Tyne or at Sunderland	47,059	—
Carried for Landsale	20,355	30,885

* When the coal is shipped, the railway company have no means of knowing where it is sent to, but nearly the whole, if not the whole, is for export. The small coal is generally used on the Tyne.

The Cumberland Coalfield.

See Appendix, List of Collieries p. 19.

The total number of collieries worked within the Cumberland coalfield have varied during the past 10 years from 23 to 30; the number at work in 1869 being 26.

There are three workable seams within this coalfield, which change their names in the neighbourhood of the three towns near which they are are worked. They are known at each town as follows:—

Whitehaven.	Workington.	Maryport.
1. Bannock band.	1. Moorbanks.	1. Ten Quarters.
2. Main band.	2. Main seam.	2. Cannel and Metal seams, divided by shale from 2 to 5 fathoms thick.
3. Six Quarter coal or Low Bottom seam.	3. Hamilton seam.	3. Lickbank seam, not workable.

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The production of the collieries of this county has been as follows since 1854 :— Cumberland coal produce to 1869.

	Tons.
1854	887,000
1855	809,546
1856	913,391
1857	942,018
1858	920,137
1859	1,041,890
1860	1,171,052
1861	1,255,644
1862	1,330,287
1863	1,327,368
1864	1,380,795
1865	1,431,047
1866	1,490,481
1867	1,512,514
1868	1,378,026
1869	1,410,808

The distribution of this coal by sea from the three Cumberland ports in each of the following years since 1850 is given below. Export of coal.

—	Whitehaven.		Maryport.		Workington.	
	Coastwise.	Foreign.	Coastwise.	Foreign.	Coastwise.	Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851	226,266	3,159	201,676	1,753	95,703	140
1855	208,722	3,943	283,603	2,503	111,216	1,210
1861	183,366	2,598	380,304	7,825	128,959	2,124
1865	146,589	1,454	459,725	6,976	145,666	840
1869	148,478	818	422,622	7,256	99,484	890

The shipments for each year are given in the tables in the Appendix; the summary of the shipments being given in the table following:— Appendix, Tables No. 72, 73, 74, p. 86.

Summary of Shipments from the Cumberland Ports.

—	Whitehaven Shipments.	Workington Shipments.	Maryport Shipments.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	2,083,027	1,206,337	3,054,871	6,344,235	1,336,120
1861 to 1869	1,449,862	1,193,100	3,827,673	6,515,635	171,400
Total	3,532,889	2,399,437	6,927,544	12,859,870	

RAILWAY DISTRIBUTION of Coal from the Cumberland Coalfield.

The London and North-western system.—The coal conveyed over the Cumberland lines and branches from the Cumberland coalfield, 1865, amounted to 189,821 tons, and in 1866 the quantities were as follows:— London and North-western Railway.

	Tons.
The quantity distributed between Penrith and Workington Bridge was	30,197
Ditto between Maryport and Whitehaven, both inclusive	399,508
Ditto for the Whitehaven, Cleator, and Egremont branch, distributed between Frizington and Egremont	88
Total	429,793

The same Railway carried coal to the following stations in 1867:—

	Tons.
Bassenthwaite	330
Blencoe	355
Braithwaite	534
Brigham	4,185

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London and North-western Railway.

	Tons.
Broughton	169
Clifton	40
Cockermouth	7,062
Egremont	31
Embleton	126
Frizington	57
Harrington	271,065
Keswick	5,525
Marron Junction	6,666
Maryport	123,234
Parton	1,479
Penrith	12
Penruddock	300
Threekeld	366
Troutbeck	486
Whitehaven	8,501
Workington	239,129
Workington Bridge	4,081
Total	673,733

In 1869 this railway carried—

	Tons.
To stations between Preston and Warrington, including both	45
To London and North-Western stations between Whitehaven and Cockermouth	385,716
To other lines	3,726
Total	389,487

Maryport and Carlisle Railway.

MARYPORT AND CARLISLE RAILWAY.—Return of coal carried by this company from the Cumberland coalfield.

	Tons.
For the year 1867	357,612
For the year 1868	335,832
Total	693,444

Thus we see that the distribution of the coal from the Cumberland coalfield by railway is confined almost entirely to its own immediate neighbourhood; a considerable portion of the coal being used at the iron works near Whitehaven and Workington.

Furness Railways.

The FURNESS RAILWAYS give the following as the distribution of coal by them during 1868 and 1869:—

	1868.	1869.
	Tons.	Tons.
From coalfields situated in the Furness (Whitehaven) districts to Furness stations	25,262	17,608
From ditto to other companies stations	22,996	16,221
	48,258	33,829
By Ulverston Canal	1,054	1,205
From Barrow Docks	21,127	22,294

THE LANCASHIRE and CHESHIRE COALFIELDS.

LANCASHIRE and CHESHIRE.

This coalfield is divided into two inspection districts, the North and East Lancashire, commonly called the Manchester district, of which Mr. Joseph Dickinson is the inspector, and the West Lancashire, the Wigan and St. Helen's districts, under the inspection of Mr. Peter Higson.

The number of collieries worked for each of the last nine years have been as follows:—

	1861.	1862.	1883.	1864.	1865.	1866.	1867.	1868.	1869.
North and East Lancashire	269	272	280	276	249	51	254	293	299
West Lancashire	104	107	99	103	93	95	99	93	93

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The production of coal from the Lancashire coalfield during the same periods have been as follows:—

——	1861.	1862.*	1863.†	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
North and East Division	5,950,000	4,975,500	5,325,500	5,900,000	6,312,000	6,570,000	6,844,000	7,053,000	7,020,000	—
Western Division - -	5,795,000	5,290,000	5,550,000	5,630,000	5,650,000	5,750,500	5,997,500	5,747,500	6,975,500	—
Cannel coal - -	450,000	332,000	—	—	—	—	—	—	—	—
Total -	12,195,000	10,597,500	10,875,500	11,530,000	11,962,000	12,320,500	12,841,500	12,800,500	13,995,500	—

* It is intimated in "Mineral Statistics" for this year, "Larger quantities than those were raised, but were sold. The stocks on hand are very large."
† Cannel coal included with other coal in this and following years.

See Chapter on CANNEL and SHALE, p. 162.

The following are the returns of the production of coals in Lancashire as given by the inspectors in their reports:—

——	1861.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
East side of Manchester - -	1,260,000							
West side of Manchester -	2,196,500							
Bury, Ainsworth, Bolton, &c. -	840,500	5,275,000	5,998,875	6,312,000	6,774,000	6,844,000	7,053,000	7,020,000
North and West of Bolton -	372,000							
Heywood, Rochdale, &c. - -	485,000							
Burnley, Colne, Blackburne, &c.	1,225,000							
Total of North and East Lancashire - -	6,379,500*	—	—	—	—	—	—	—
Western Division - -	No Return.	—	5,750,000	6,000,000†	—	—	—	—

* Of this about 99,000 tons is cannel coal, worked at Worsley, Hulton, Westhoughton, and Blackrod, the greater portion being got in Blackrod.
† Mr. Higson gives the total return of West Lancashire and North Wales together as 7,500,000 tons in 1864; and he says there was an increase of 500,000 tons in 1865. The above is computed. In 1866 he gives for West Lancashire and North Wales 8,000,000, in 1867 8,350,000, in 1868 7,600,000, and in 1869 8,018,939.

It will be seen that in several instances the return of Mr. Dickenson and the quantities given in the Mineral Statistics agree. In those years the Keeper of Mining Records has availed himself of the returns furnished to the Home Office by the inspector, the agreement between the two sets being in very close accord.

SHIPMENTS of COAL from the LANCASHIRE and CHESHIRE COALFIELDS since 1850. (*For detailed Tables, see Appendix.*)

Appendix, Shipments Tables No. 75, 76, 77, 78, 79, 80, p. 88.

——	Chester Shipments.	Liverpool Shipments.	Runcorn Shipments.	Preston Shipments.	Fleetwood Shipments.	Lancaster Shipments.	Total Shipments.	Increase over previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860 - -	781,465	5,696,699	3,239	364,488	261,263	82,631	7,189,785	4,032,988
1861 to 1869 - -	577,120	7,874,522	774,147	321,639	145,275	43,880	9,736,583	2,546,798
Total - -	1,361,585	13,571,221	777,386	686,127	406,538	126,511	16,926,368	6,579,786

The consumption of coal by the steamers sailing from the port of Liverpool will be given on a future page.

A detailed statement of the exportation of the coals from Lancashire to Foreign countries appears in the Appendix.

Appendix.

The total quantities sent to Foreign ports from the port of Liverpool in each year since 1860 has been as follows. It must be borne in mind, however, that although the bulk of this coal is derived from the Lancashire field, that much of it,—such as is shipped at Birkenhead,—is derived from the Cheshire and North Wales coalfield, and a small quantity is received from Yorkshire.

1860 - - - - - -	590,128 tons.
1861 - - - - - -	624,549 „
1862 - - - - - -	623,450 „
1863 - - - - - -	586,733 „
1864 - - - - - -	742,279 „
1865 - - - - - -	616,976 „
1866 - - - - - -	707,880 „
1867 - - - - - -	678,704 „
1868 - - - - - -	621,856 „
1869 - - - - - -	550,538 „
1870 - - - - - -	531,719

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During the same periods the shipments from the port of Liverpool coastwise have been,—

Coastwise shipments.

——	England.	Ireland.	Scotland.	Wales.	Isle of Man.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1860	12,949	96,898	2,891	45,485	2,015	160,238
1861	757	66,094	1,865	22,608	407	91,731
1862	2,526	56,084	1,353	23,158	1,030	84,151
1863	3,068	71,166	1,847	27,985	1,904	105,970
1864	8,490	94,375	3,087	34,033	1,769	141,754
1865	10,046	86,265	2,911	29,707	1,637	130,566
1866	8,934	86,525	1,684	30,893	2,155	130,191
1867	12,444	87,747	2,963	39,626	2,780	145,560
1868	5,735	58,218	1,089	35,285	2,010	102,337
1869	5,073	72,905	2,058	36,482	1,585	118,103
1870	10,191	92,332	1,983	33,050	3,797	141,353

Total shipments.

The total shipments to foreign ports and coastwise having been in—

1860 - - - - - 750,366 tons.
1865 - - - - - 747,542 „ decrease 2,824
1870 - - - - - 673,072 „ „ 74,470

RAILWAY DISTRIBUTION of Coal from the Lancashire and Cheshire Coal Pits.

London and North-western Railway.

London and North-Western Railway.—The total quantity of coal carried by this railway from the Lancashire coal in 1865 was 3,321,737 tons, or, with the coal carried for other companies, 4,032,446 tons, and in 1868 3,741,975 tons.

The following are some of the more important lines of distribution:—

The quantity distributed in 1867 between—	Tons.
Chester and Holyhead, was - - - - - - -	70,651
Birkenhead and Crewe, was - - - - - -	140,549
Crewe and Wakefield and Leeds, was - - - -	64,559
Crewe and Acton, was - - - - - -	320,946
Crewe and London, was - - - - - -	202,861
Liverpool and Manchester, was - - - - -	1,903,914
Stockport and Matlock Bridge, was - - - - -	2,325
Oxford and Cambridge and Banbury, was - - -	9,403
Blisworth and Peterborough, was - - - - -	2,400
Leamington and Stamford, was - - - - -	9,599
Leamington and Leicester, was - - - - -	1,835
Rugby and Stafford and Lichfield, was - - - -	18,342
Stafford and Welshpool, was - - - - - -	11,794
Crewe and Rhymney, was - - - - - -	14,895
Penrith and Ingleton, was - - - - - -	1,988
Graygrigg and Garstang, was - - - - -	20,332
Craven Arms and Llandovery, was - - - - -	220
Maryport receives - - - - - -	25
Total - -	2,796,638

The distribution by the London and North-Western to other railways in 1867 and 1868 was as follows, the total quantity carried in 1868 being 366,378 tons.

The coals carried over the London and North-Western for the Great Western Railway in 1867 from this coalfield were as follows:—

The quantity distributed between—	Tons.
Didcott and Birmingham - - - - - - -	566
Didcot and London - - - - - - -	21,095
Reading and Marlborough - - - - - - -	811
Oxford and Worcester - - - - - - -	2,122
Warwick and Honeybourne - - - - - - -	1,691
Baschurch and Bridgenorth - - - - - -	354
Horderley and Montgomery - - - - - - -	98
Maidenhead and Oxford - - - - - - -	674
Birmingham and Wolverhampton - - - - -	7,901
Leominster and Kington - - - - - -	145
Market Drayton receives - - - - - - -	221
Kidderminster „ - - - - - - -	761
Bristol receives - - - - - - - -	4
Total - -	36,443
In 1868 the total quantity being - - - - -	32,585

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Midland Railway.

For the MIDLAND RAILWAY the London and North-Western Railway carried in 1867 10,317 tons.

The quantity distributed between—

	Tons.
Clapham and Lancaster	2,569
Radford and Nottingham	7,301
Melton Mowbray receives	162
Wichnor receives	285
Total	10,317
In 1868 the total quantity was	5,172

Southern Railways.

The COAL CONVEYED over the LONDON and NORTH-WESTERN in 1867 for the LONDON, BRIGHTON, and SOUTH COAST RAILWAY from the LANCASHIRE COALFIELD was as follows:—

The quantity distributed between—

	Tons.
Caterham and Brighton	3,299
Hastings and Bosham	1,575
Guildford and Shoreham	1,068
Tunbridge Wells and Petworth	2,339
Leatherhead and London	7,326
Total	15,607
In 1868 the total quantity was	4,877

In 1868 the distribution of the Lancashire coal by the London and North-Western Railway was as follows:—

	Tons.
Between Preston* and Carlisle	23,649
„ Preston and Warrington, *inclusive*	711,304
West of Warrington to Liverpool, including Liverpool	896,962
East of Warrington to Manchester, including Manchester	162,624
Between Manchester and Wigan, exclusive of Manchester	158,555
„ Garston and Timperley	857,601
„ Warrington and Crewe, including Crewe	63,688
„ Manchester and Leeds	45,716
„ Manchester and Crewe, including Buxton branch and Macclesfield branch	56,468
„ Birkenhead and Chester	162,535
„ Crewe and Holyhead	36,877
„ Crewe and Shrewsbury, including Shrewsbury	15,152
„ Shrewsbury and Hereford, including Central Wales branch	2,404
„ Stafford and Welshpool, exclusive of Stafford	1,163
„ Crewe and Rugby, including Rugby and Stafford	4,090
„ Stafford and Birmingham, including South Stafford stations	6,715
„ Birmingham and Rugby, excluding both	11,181
On the Rugby and Stamford branch	4,140
„ Blisworth and Peterboro'	2,214
„ Bletchley and Cambridge	6,101
„ Buckinghamshire	922
Between Rugby and London, exclusive of London	22,797
LONDON	122,741
	3,375,597
Carried to foreign lines	366,378
Total carried	3,741,975

COAL conveyed by the LONDON and NORTH-WESTERN RAILWAY to the LONDON DISTRICT.

From the North and East Divisions, or Manchester District.

Name of Colliery.	Situation.	1867. Tons.	cwts.	1868. Tons.	cwts.
Anderton Hall	Blackrod	113	15	951	6
Arley Main	Do.	946	11	86	3
Atherton	Atherton	170	18	78	4
Clifton Hall	Manchester	341	7	—	
Cliviger	Burnley	48	2	—	
Hulton	Over Hulton	31	13	2,685	18

* THE PRESTON AND LONGRIDGE RAILWAY receives coal only from other lines, but it is only eight miles in length. Its termini are Preston and a stone quarry at Longridge.

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From the St. Helen's District.

Haydock	Ashton in Makerfield	186 9	236	4
Ravenhead	Sutton	373 17	—	
Riding Lane	Ashton in Makerfield	179 17	1,834	14
Sankey Brook	Parr	15 13	—	
Peaseley Cross	Do.	1,478 8	—	
Rose Bridge	Rainford	13,292 14	654	8
St. Helen's	St. Helen's	77 6	44	16

From the Wigan District.

Barley Brook	Wigan	—	132	19
Douglas Bank	Do.	—	10,393	7
Hindley Green	Hindley	13 8	211	1
Ince	Ince	38,630 15	30,419	18
Kirkless Hall	Kirkless	1,080 19	135	5
Ladies Lane	Hindley	—	3,069	4
Mesnes	Wigan	—	156	4
Moss Hall	Rainford	88 19	—	
Norley	Pemberton	—	2,377	18
Orrell	Wigan	6,074 3	6,846	14
Park Lane	Do.	—	2,377	18
Pemberton	Orrell	3,702 3	5,693	9
Springs	Ince in Makerfield	—	1,297	11
Strangeways Hall	Hindley	6 1	—	
Wigan Coal Company	Wigan	93,521 3	62,892	7
Winstanley	Winstanley	3,400 12	455	6
Swinley	Gidlow Lane	5,242 11	4,290	12
Gidlow; called Rylands in returns. Rylands and Cross, proprietors.	Do.	33 9	—	

The following quantities of coal from the Lancashire coal field were conveyed over the MIDLAND System in 1867:—

The quantity distributed between—	Tons.
Morcambe and Gargrave is	7,426
Gargrave and Colne is	4,235
Gargrave and Leeds is	2,253
Matlock Bath and Millers Dale is	826
Total	14,740

This coal is not carried by this line farther north than Clapham in Yorkshire, nor farther south than Matlock Bath.

The quantities given below were those of coals carried from the Lancashire coal field in 1867 for the different railways named:—

For the LANCASHIRE and YORKSHIRE RAILWAY.

Lancashire and Yorkshire Railway.

The quantity distributed between—	Tons.
Preston Road and Hindley	80,913
Fleetwood and Normanton	683,226
Chatburn and Bolton	90,352
Farrington and Liverpool	234
Ashton and Rochdale	37,374
Accrington and Clifton Junction	3,063
Liverpool and Southport	1,573
Total	896,735

	Tons.
In 1868 the Lancashire and Yorkshire received from this line	153,847
In the same year the MANCHESTER SOUTH JUNCTION and Altrincham	43,015
PRESTON and WYRE receives in 1868	17,326
The LONDON and SOUTH-WESTERN receives in 1868	5,849

Cambrian Railway.

The CAMBRIAN RAILWAY received from the London and North-Western Railway in 1867, and distributed between—

	Tons.
Creccieth and Aberystwith	2,734
Machynlleth and Whitchurch	5,722
Total	8,456
In 1868 the total quantity was	8,078

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The Cambrian Railway received for stations in Wales of Lancashire coal 6,905 tons, the largest quantities being,—

	Tons.
Ellesmere	730
Oswestry	592
Llansaintffraid	277
Montgomery	451
Llanidloes	738
Cemmes Road	801
Machynlleth	507
Penmaenpool	1,031
Afon Wen	253

The London, Chatham, and Dover Railway received in 1867 from the Lancashire coalfield and distributed between—

	Tons.
London and Dover	1,550
Ramsgate receives	6
Total	1,556

In 1868 this line received from the London and North-Western - 1,161 tons.

	Tons.
The Anglesea Central receives in 1867, and delivers between Amlwch and Gaerwen	4,350
And in 1868	5,177
The Cheshire Midland receives	11,805

The Furness Abbey Railway in 1867 distributed between—

Carnforth and Furness	31,667
Coniston and Piel	6,469
Total	38,136
And in 1868 this line received	86,395

The North Staffordshire Railway received and distributed in 1867 between—

	Tons.
*Egginton and Oakmoor	171
Colwich and Congleton	5,596
Total	5,767
The quantity received in 1868 was	986

The Denbigh, Ruthin, and Corwen Railway in 1867 distributed between Corwen and Rhyll	2,410
For the Manchester, Sheffield, and Lincolnshire, Glossop receives in 1867	15
In 1868 this line received from the London and North-Western	997
For the Great Eastern Railway, Dunham receives	13
For the South-Eastern Railway, Dorking receives	231
For the North-Eastern Railway, Darlington receives in 1867	735
The Stockton and Darlington receives in 1868	502
For the Brecon and Merthyr Line, Hay receives	75

The most northerly point to which this coal is carried by aid of the London and North-Western is Darlington, most southerly Brighton, most easterly Dunham, and most westerly Holyhead.

Lancashire and Yorkshire Railway.

The Lancashire and Yorkshire Railway in the 12 months ending December 1866 carried from the Lancashire coalfield 143,957 tons, the largest quantities having been taken from the following stations:—

	Tons.
Victoria	12,591
Oldham Road	5,414
Miles Platting	4,061
Oldham	18,072
Shaw	3,088
Littleborough	888
Portsmouth	9,859
Holme	62,017
Townley	27,191
Grindford Bar	193,651
West Houghton	9,306
Wigan	225,235
Pemberton	137,479
Rainford Junction	208,889
Over Darwen	6,624
Blackburn	8,462
Bingley Road	58,170
Radcliffe Bridge	28,527
Railway Colliery	23,110

And in 1869 this railway carried from Lancashire 2,261,511 tons, of which weight a large quantity was distributed after nearly the same order as in previous years.

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Manchester, Sheffield, and Lincolnshire Railway.

The MANCHESTER, SHEFFIELD, and LINCOLNSHIRE Railway received from Collieries in LANCASHIRE and YORKSHIRE in—

——	1866.	1867*.	1868*.	1869*.
	Tons.	Tons.	Tons.	Tons.
Total weight carried - - - - - -	1,845,028	2,264,689	2,188,905	2,322,788
This includes the following:—				
Forwarded to Great Northern at Retford - -	101,490	117,304	106,738	103,190
„ ditto at Hexthorpe -	679,089	796,511	686,991	664,053
„ Midland Railway at Mexbro' -	103,202	92,725	130,416	140,740
„ ditto at Beighton - -	7,735	13,204	12,794	22,206
„ Lancashire and Yorkshire at Barnsley	24,000	36,003	19,805	14,954
Received by Manchester, Sheffield, and Lincolnshire from London and North-Western at Ardwick -	3,594	6,938	2,708	1,590
Received by ditto from Midland at Beighton -	27,351	45,283	24,505	26,793

* Received at own local stations in 1867 - - - - - - 1,156,721 tons.
„ from *Lancashire* in 1867 - - - - - - 46,808 „
„ at own local stations in 1868 - - - - - - 1,194,518 „
„ from *Lancashire* in 1868 - - - - - - 24,659 „
„ at own local stations in 1869 - - - - - 1,311,536 „
„ from *Lancashire* in 1869 - - - - - - 19,781 „

The MANCHESTER, SHEFFIELD, and LINCOLNSHIRE RAILWAY received and carried from this coal-field principally to Manchester, Ardwick, Gorton, Guide Bridge, Ashton, and Staley Bridge,—

——	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Received - -	99,922	107,834	74,192	79,287	63,577	63,152	80,428	—	—	—
Forwarded - -	11,581	15,228	19,637	307	571	1,985	3,594	6,938	—	1,590

The MANCHESTER, SHEFFIELD, and LINCOLNSHIRE Railway carried from—

——	1860.	1869.
	Tons.	Tons.
Wigan, Ardwick - -	3,594	1,590
Ashton under Lyne, Newton -	32,049	18,191

St. Helen's Canal.

Statement of Coal Traffic forwarded from the ST. HELEN'S COALFIELD by the ST. HELEN'S CANAL for the Year 1868.

From	To	Tons.
Blackbrook - -	Gerrard's Bridge -	17,226
„ - -	St. Helen's - -	8,010
Bradley - -	Engine Lock - -	101
„ - -	St. Helen's - -	592
St. Helen's - -	Sankey - -	1,896
„ - -	Widnes - -	170,546
Widnes - -	St. Helen's - -	152
	Total - -	198,523
Madeley Market Canal	Coalport - -	67,805

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Coal conveyed along the Bridgewater Canal in the Year 1868.*

Bridgewater canal, 1868.

—	From the Worsley Coalfield.	From the Wigan Coalfield.	From the St. Helen's District.	Total.
	Tons.	Tons.	Tons.	Tons.
To Manchester and adjacent towns	217,582	147,585	—	365,167
To wharves on the canal in North Cheshire - - -	45,677	7,983	3,704	57,364
To the Cheshire salt district -	127,540	172,071	—	299,611
To the River Mersey for export and steam purposes - -	110,715	83,552	1,803	196,070
Total - -	501,514	411,191	5,507	918,212

The Leeds and Liverpool canal forwarded the following quantities of Lancashire coal in 1868:—

Leeds and Liverpool canal. For the coal *received* see Appendix No. 81. p. 88.

Lancashire coals forwarded.	Tons.
Abram - - - - -	22,807
Appley - - - - -	17,158
Altham - - - - -	20,769
Bamferlong - - - - -	44,847
Blackburn - - - - -	252
Blackburn Locks - - - -	172
Brynn Moss - - - -	86,824
Burscough - - - - -	7
Church - - - - -	6,912
Crook - - - - - -	181,553¾
Eli Meadow - - - -	44,521¼
Finch Mills - - - - -	45,477
Foulridge - - - - -	10
Grimshaw Park - - - -	73
Gannow - - - - -	83,544
Ince - - - - - -	130,460¾
Johnson's Hill - - - -	93,770
Kirkdale - - - - -	12,476¾
Leigh - - - - -	6,587
Linacre - - - - -	2,401
Litherland - - - - -	34
Liverpool - - - - -	10,092
Liverpool Junction - - - -	32
Lob Lane - - - - -	48,462
Lock Head - - - - -	10,384
Riley Bridge - - - - -	576
Plank Lane - - - - -	66,838
Rishton - - - - -	2,027
Rose Bridge - - - -	70,386
Rowley - - - - -	22,916
Shutt Hall - - - - -	12,107
Shuttleworth Hall - - - -	10,134
West Leigh - - - -	208,016¾
Whittlefield - - - - -	190
Wigan - - - - -	84,574¼
	1,347,391½

* The canals carrying coal are:—

The Manchester and Liverpool, Manchester and Runcorn, and Mersey and Irwell. These are practically the same thing, being in the hands of the Bridgewater trustees. Manager at Liverpool, Mr. W. H. Boddington, Duke's Dock. The coal is from Worsley, Leigh, and Wigan district to Runcorn and Spool, a large quantity being shipped at former place in coasting vessels.

Leeds and Liverpool. Manager here, Mr. Thorley, Canal Bank, Oldhall Street. Their coal is from the Wigan district.

Sankey Canal brings the coal from St. Helen's district. The canal is leased to the London and North-western Railway Company.

The only other canal is the Shropshire Union, which enters the Mersey at Ellesmere Port, about 10 miles down the river. It does not bring coal to Liverpool, but some is brought to Ellesmere Port for coasting vessels. The agent is at the port.

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The Cheshire Coalfield.

The number of collieries in the Cheshire coalfield in the years from 1856 to 1869 will be shown in the accompanying table, and the production of the county for the same years.

Collieries to 1869.

Years.	No. of Collieries.	Tons of Coal produced.
1856	31	754,327
1857	31	750,500
1858	35	695,450
1859	35	700,500
1860	35	750,500
1861	39	765,570
1862	39	787,750
1863	39	822,750
1864	38	821,700
1865	39	850,000
1866	38	893,500
1867	39	935,000
1868	29*	937,500
1869	28*	957,150
1870	Not complete.	

* Several small collieries, chiefly near Macclesfield, have ceased to work in those years.

It is not an easy matter to determine the quantities of coal shipped from this coalfield; much of it will have been shipped from ports on the Mersey, which will have been returned with the port of Liverpool. The shipments from Chester will have been:—

See Appendix Chester, Table No. 80, p. 88.

—	Coastwise.	Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
From 1851 to 1860	771,866	9,599	781,465
From 1861 to 1869	570,378	9,742	577,120

The quantities of this coal sent to foreign ports do not appear to have varied much; and the decrease in the shipments coastwise will be explained by the large quantities carried by the railways.

The Railway Distribution of Cheshire Coal.

The London and North-western Railway carried in 1865 135,092 tons, and in 1868 148,236 tons. In 1867 the principal quantities were received at the following stations:—

London and North-western Railway.

	Tons.
Abergele, Denbigh	1,868
Alderley, Cheshire	5,379
Beeston, ditto	1,939
Birmingham, Warwick	55
Buxton, Derby	2,722
Cheadle, Cheshire	3,285
Chelford, ditto	3,897
Chester, ditto	326
Delph, Yorkshire	1,546
Dove Holes, Derby	698
Greenfield, Yorkshire	3,729
Handforth, Cheshire	413
Longsight, Lancashire	4,950
Macclesfield, Cheshire	11,287
Manchester, Lancashire	8,476
Miller's Dale, Derby	608
New Mills, Cheshire	1,974
Oxford Road, Oxford	1,336
St. Asaph, Flint	981
Staley Bridge, Lancashire	7,884
Stockport, ditto	51,014
Wilmslow, Cheshire	4,360

In all 66,729 tons were distributed to stations on the London and North-western lines; the remainder passed on to other railways.

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In the year ending December 31st this railway carried from the Cheshire collieries to stations on the London and North-western line 121,020 tons, and delivered to other railways 2,694, making a total of coal carried 123,896 tons. CHESHIRE

COALS conveyed over the LONDON and NORTH-WESTERN RAILWAY for the NORTH STAFFORDSHIRE RAILWAY.

	Tons.
From the Cheshire coalfield, and distributed between Colwich and Congleton	25
For the Anglesea Central Railway, and distributed between Amlwch and Gaerwen	92
For the Denbigh, Ruthin, and Corwen Railway, and distributed between Corwen and Rhyll	1,186
For the Cheshire Midland Railway, from Altrincham to Northwich, over which is distributed	226

This coal is carried, by means of the London and North-western, as far north as Saddleworth, and as far south as Oxford Road.

In 1868 the principal lines of distribution were:—

	Tons.
West of Warrington to Liverpool, including Liverpool	1,482
East of ditto to Manchester, including Manchester	8,834
Warrington and Crewe, including Crewe	40,593
Manchester and Leeds	10,070
Between Manchester and Macclesfield Branch	78,581
„ Birkenhead and Chester	4,210
„ Crewe and Holyhead	2,281
„ Ditto and Shrewsbury	532
Total to foreign lines	1,533
These were:—	
MANCHESTER SOUTH JUNCTION *receiving*	30
The MIDLAND	190
The NORTH STAFFORDSHIRE	1,313
	1,533

The MANCHESTER, SHEFFIELD, and LINCOLNSHIRE RAILWAY carried from the Ashton-under-Line district, coal received at the Newton Station, Cheshire, 32,049 tons.

NORTH WALES. NORTH WALES.

THE DENBIGHSHIRE COALFIELD. Denbighshire.

The DENBIGHSHIRE coalfield is about eighteen miles in length, commencing about three miles south of Oswestry, extending northward, by Ruabon and Wrexham, to the valley of the Alyn. The coal seams of this district are:—

	Ft.	In.		Ft.	In.
1. Smith coal	2	2	to 2	4	
2. Drowsall coal (good)	3	0			
3. Powell coal	3	3			
4. Two yard coal	5	0	to 6	0	
5. Crank coal	2	8	to 3	0	
6. Brassy coal	5	0			
7. Main coal	6	0	to 7	6*	

In the last ten years the production, and the number of collieries at work, in each year, have been as follows:—

Years.	No. of Collieries.	Tons of Coal raised.
1860	39	1,189,500
1861	35	1,250,000
1862	35	1,016,000
1863	35	1,078,500
1864	31	1,381,560
1865	36	1,395,000
1866	35	1,500,000
1867	34	1,475,250
1868	29	1,520,000
1869	31	1,427,701
1870		

THE FLINTSHIRE COALFIELD. FLINTSHIRE.

This coalfield is separated from the Denbighshire coal by an upthrow of carboniferous limestone and millstone grit, between Gresford and Hope. From this it extends on the western side of the estuary of

* The Coalfields of Great Britain, by Edward Hull, B.A., F.R.S.

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the Dee to Point of Air, a distance of about 15 miles. Mr. Hull gives the following as the thickness of the coal seams:—

	Ft.	In.
1. *Four-foot coal* {*coal* / *cannel*}	4	0
2. *Bind coal*	2	6
3. {*Hollin*, in 3 beds	6	6
{Cannel	1	6
4. *Brassy coal*	3	0
5. Main coal	7	0
6. Lower four-foot	4	0

The "*Main*" and "*Brassy*" coal of Flintshire and Denbighshire correspond. The "Hollin" of the first is the "Two yard" of the second; while the "*Bind*" and the "Powell" are identified.

The Anglesea Coalfield.

Anglesea.

This little outlying coalfield may properly be associated with the Flintshire field. It forms a band of country stretching from Hirdre-faig to Malldraeth Bay, a distance of nine miles, its breadth at Malldraeth Marsh being about a mile and a half. The section given by Professor Ramsay* shows the following coals:—

	Ft.	In.	Ft.	In.
1. Coal ("Glo pux"), lying in lumps, *unworkable*	9	0		
2. Coal	3	0		
3. Coal	4	0		
4. Coal, *irregular*, "Glo pux"	2	0		
5. Coal	6	0		
7. Coal (probable position of Berw-Uchaf coal in 3 beds, with thin partings)	7	0 to 8	0	
8. Coal, probable position of Glantreath coal in millstone grit	2	0 to 3	0	

The Railway Distribution of North Wales Coal.

The Great Western Railway in 1866 carried from the North Wales Coalfield a total of 627,355 tons to stations on the line, and 76,024 tons to stations on other lines. The chief stations receiving coal were:—

Great Western Railway.

	Tons.
Abingdon, Berkshire	1,485
Banbury, Oxford	3,276
Baschurch, Shropshire	4,003
Basingstoke, Hampshire	7,092
Bilston, Staffordshire	2,190
Birkenhead, Cheshire	253,241
Brentford, Middlesex	694
Bridgnorth, Shropshire	936
Carrog, Merionethshire	1,132
Chester, Cheshire	142,725
Chippenham, Wilts	980
Corwen, Merionethshire	8,023
Croes Newydd, Denbigh	7,129
Didcot, Berkshire	521
Ealing, Middlesex	347
Gobowen, Shropshire	364
Hanwood, ditto	492
Hereford, Hertford	1,215
Hollinswood, Shropshire	22,173
Ironbridge, ditto	1,148
Kidderminster, Worcester	1,727
Leominster, Herefordshire	815
Llandrillo, Merionethshire	952
Llangollen Road, Denbigh	2,967
London, Middlesex	11,819
Marlow Road, Buckingham	1,353
Minsterley, Shropshire	6,811

* Above the limestone the coal measures, including the millstone grit, dip S.E., about 20°. Together with the Permian rocks they form the entire substrata underneath Malldraeth Marsh, which is about 1½ mile broad. The length of the entire coalfield from the neighbourhood of Hirdre-faig to Malldraeth Bay is nine miles. The whole forms a marshy tract very little above the sea level, and it is only occasionally on the western edges that any of the coal measure beds are seen on the banks that slope upwards from the alluvium, moss, and sand of the marsh. Malldraeth sands are covered by the tide at high water.

At the base lies the usual millstone grit, about 400 feet thick. It consists of Yellow Sandstone and Conglomerate, and probably in the midst contains a bed of coal from three quarters to one yard thick, heretofore worked at Glantraeth, and which I have therefore termed the Glantraeth coal. Above it in the ordinary coal measures there are six other beds, all crossed by the section.

The south-eastern edge of the coalfield is bounded by a fault, which on the north, at Plas Berw, splits into two. Between Berw-Uchaf and the sea, near Llanddwyn Island, the fault, being a down-throw on the west, causes the Permian and coal measure strata to abut on metamorphic Cambrian rocks; but north-east of Berw-Uchaf the amount of the general throw decreases, and between the two faults a strip of carboniferous limestone comes in, abutting on Permian and Silurian rocks in the manner shown in the section. There can be no doubt that the limestone underlies the whole coalfield. The amount of the throw of the great boundary fault may also be approximately obtained. Where crossed by the section near Plas Berw the western fault is a down-throw on the north-west of about 2,300 feet. The eastern branch, throwing the limestone against the Silurian rocks, is a down-throw in the same direction of uncertain amount, but probably not exceeding 400 or 500 feet. But for the great boundary fault, throwing down the rocks so deep, it is probable that the coal measures of Anglesea would have been entirely denuded away, and there would probably have remained in what is now Malldraeth Marsh a broad continuation of the limestone that lies between Pentraeth and Lligwy Bay.

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Great Western Railway.

	Tons.
Oswestry, Shropshire	31,285
Oxford, Oxford	1,461
Reading, Berkshire	10,084
Shrewsbury, Shropshire	31,559
Stratford-on-Avon, Warwickshire	1,490
Taplow, Berkshire	6,335
Thatcham, ditto	1,725
Uxbridge, Middlesex	2,574
Wellington, Shropshire	2,288
Weymouth, Dorset	3,630
Windsor, Berkshire	2,150
Woburn Green, Buckingham	5,206
Wolverhampton, Stafford	3,066
Wrexham, Denbighshire	2,234
Wycombe, Buckingham	2,616

Coal delivered to other railways.

The GREAT WESTERN RAILWAY in the same year carried as stated to stations beyond their line a total of 76,024 tons, the largest deliveries being:—

Station.	County.	Railway.	Tons.
Abermule	Montgomeryshire	Cambrian	224
Aberystwith	Cardiganshire	„	492
Bromsgrove	Worcestershire	Midland	489
Bishop's Castle	Shropshire	Bishop's Castle Railway	641
Buttington	Montgomeryshire	Shrewsbury and Welshpool	305
Caersws Road	„	Cambrian	901
Cemmes Road	„	„	1,002
Denbigh	Denbigh	Denbigh, Ruthin, and Corwen	7,374
Ellesmere	Shropshire	Cambrian	728
Eyarth	Denbigh	Denbigh, Ruthin, and Corwen	875
Etruria	Stafford	North Stafford	8,591
Four Crosses	Montgomer'	Cambrian	888
Flint	Flintshire	London and North-western	8,167
Gwyddelwern	Merionethshire	Denbigh, Ruthin, and Corwen	4,285
Kerry	Montgomeryshire	Cambrian	702
Knighton	Radnorshire	London and North-western	841
Llanrhaiadr	Denbigh	Denbigh, Ruthin, and Corwen	1,102
Llanfechan	Montgomery	Cambrian	675
Llanfyllin	„	„	3,426
Llanidloes	„	„	2,547
Llangennech	Carmarthen	Llanelly Railway and Dock	3,296
Llausaintffraid	Montgomery	Cambrian	1,519
Machynlleth	„	„	841
Montgomery	„	„	1,601
Newtown	„	„	2,860
Penmaenmaur	Carnarvon	London and North-western	909
Rhewl	Denbighshire	Denbigh, Ruthin, and Corwen	998
Ruthin	„	„	3,496
Streatham Common	Surrey	London, Brighton, and South Coast	3,041
Towyn	Merionethshire	Cambrian	504
Welshpool	Montgomery	„	3,288

The London and North-western Railway 1865 to 1867.

The LONDON and NORTH-WESTERN in 1865 carried 310,863 tons, and in 1867 distributed coal from the FLINTSHIRE collieries as follows:—

	Tons.
Between Chester and Holyhead	194,350
„ Birkenhead and Crewe	97,474
„ London and Crewe	26,047
„ Crewe and Leeds	5,406
„ Rugby and Stafford	1,746
„ Liverpool and Manchester	24,533
Kington receives	11
Total	349,567

COAL conveyed over the LONDON and NORTH-WESTERN for the ANGLESEA CENTRAL, the quantity distributed between Amlwch and Gaerwen — 3,635 tons.

For the Cambrian line,—

Aberystwith receives — 19 tons.
Newton „ — 342 „

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The Coals conveyed over the London and North-western from the Carnarvonshire coalfield amounted to 174 tons only, and these quantities were distributed between Chester and Holyhead 141 tons, while Rhosgoch receives 33 tons.

London and North-western Railway.

The largest quantities delivered by the London and North-western Railway were as follows:—

	Tons.
Abergele	4,644
Amlwch	2,196
Bagilt	15,723
Birkenhead	95,866
Birmingham	1,670
Bodorgan	1,534
Broughton Hall	553
Caernarvon	997
Chester	33,048
Coed Talon	2,331
Colwyn	6,420
Conway	1,864
Croydon	459
Denbigh	965
Denton, Lancashire	406
Dunham Hill, Cheshire	715
Flint	50,918
Hadlow Road, Cheshire	448
Holyhead	24,364
Holywell	8,804
Hope, Flint	2,198
Hove, Sussex, London, Brighton, and South Coast	1,388
Llandudno	743
Llanfair	1,538
Llangefni, Anglesea	639
Llanrwst	936
London	26,039
Manchester	9,607
Mold and Mold Junction	2,147
Neston	350
Newtown, Montgomery	342
Oxford Road	13,566
Padeswood, Flint	1,541
Penmaenmawr	814
Prestatyn	12,066
Queensferry, Flint	2,561
Rhuddlaw	1,140
Rhyl	4,807
St. Asaph	1,632
Saltney Wharf, Cheshire	9,301
Shrewsbury	182
Tamworth	308
Trefnant, Denbigh	547
Troutbeck, Cumberland	486
Valley, Anglesea	439
Windsor	5,351

Anglesea coalfield.

The coals from the Anglesea coalfield were conveyed by the London and North-western, and distributed in the following manner:—

	Tons.
Buckley received	25
Cefn-y-bedd	6
Holland Arms	8
Llangefni	8
Rhosgoch	9
	56

The London and North-western conveyed from the Flintshire coalfield for the London, Brighton, and South Coast and to other lines the following quantities, which were distributed between—

	Tons.
Croydon and Waddon	519
Hastings and Bosham	1,402
while Redhill receives	121
and Mitcham	161
Total	2,203

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For the LONDON, CHATHAM, and DOVER RAILWAY, distributed between London and Dover - - - - - - - 162 tons.

London and North-western for other railways.

For the LANCASHIRE and YORKSHIRE Line, distributed between—

	Tons.
Ashton and Rochdale - - -	434
Normanton and Fleetwood - - -	233
Ramsbottom - - -	17
Wigan - - - - -	52
Total - -	736

	Tons.
For the DENBIGH, RUTHIN, and CORWEN, between Corwen and Rhyll - - - - - -	3,202
For the NORTH LONDON, received at Bow - - - -	16
For the WEST LONDON JOINT, received at Chelsea - -	39
For the MIDLAND, Cheshire, received at Altrincham - -	43
For the FURNESS LINE, received at Broughton Hall - -	553

This line also conveyed from the FLINTSHIRE coalfield for the GREAT WESTERN 13,854 tons, which were distributed as follows:—

	Tons.
Between Oxford and Banbury - - -	13,573
„ London and Reading - - -	102
Bath receives - - - - -	9
Kidderminster - - - - -	26
Smethwick - - - - -	17
High Wycombe - - - - -	12
Cardiff - - - - - -	80
Worcester - - - - - -	35
Total - - -	13,854

In 1868 the LONDON and NORTH-WESTERN RAILWAY received from the Flintshire coalfield a total of 381,668 tons. This was distributed as follows:—

London and North-western 1868.

	Tons.
Between Preston and Warrington, including Warrington - -	1,368
West of Warrington to Liverpool, including Liverpool - - -	826
East of ditto to Manchester, including Manchester - -	9,272
Between Manchester and Wigan, exclusive of Manchester - -	6
„ Garston and Timperley - - - - -	2,734
„ Warrington and Crewe, including Crewe - - -	2,363
„ Manchester and Leeds - - - - -	41
„ „ and Macclesfield Branch - - - -	31
„ Birkenhead and Chester - - - - -	149,609
„ Crewe and Holyhead - - - - - -	161,525
„ „ and Shrewsbury - - - - -	37
The Central Wales Branch - - - - - -	4,378
„ Crewe and Rugby, Stafford and Birmingham, Birmingham and Rugby, and Buckinghamshire - - - -	376
Between Rugby and London, exclusive of London - - -	7,927
Total weight carried to other lines - - - - -	41,175
	381,668

The coal carried to other lines was as follows:—

	Tons.
Anglesea Central - - - - - -	1,379
Denbigh, Ruthin, and Corwen - - - - -	402
Lancashire and Yorkshire - - - - -	21,505
London, Brighton, and South Coast - - - -	1,080
London, Chatham, and Dover - - - -	50
London and South-western - - - - -	194
Manchester South Junction and Altrincham - - -	15,809
Rhymney - - - - - - -	254
Wrexham, Mold, and Connah's Quay - - -	502
	41,175

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Cambrian Railway.

The Cambrian Railway carried in 1868 from the North Wales District a total of 45,358 tons, and from Oswestry, beyond this, a further quantity of 2,224 tons.

The largest quantities were received at the following stations:—

——	North Wales.	Oswestry.
	Tons.	Tons.
Whitchurch	186	—
Ferns Bank	1,059	709
Bettisfield	1,598	110
Ellesmere	791	—
Llynclys	6,151	—
Llanymynech	2,064	776
Llansaintffraid	1,511	—
Llanfechan	617	—
Llanfyllin	3,470	—
Four Crosses	1,000	—
Welsh Pool	2,974	—
Forden	1,261	—
Montgomery	2,159	—
Kerry	871	—
Newtown	4,631	—
Llanidloes	4,414	—
Caersws	790	—
Machynlleth	864	—
Aberystwith	678	—
Penmaenpool	774	—
Penrhyndendraeth	758	43
Port Madoc	1,094	5
Afon Wen	620	—
Pwllheli	179	—

Shropshire Union.

Shropshire Union Railways and Canal Company.

Statement showing the weight of Coal passed over the Shropshire Union Company's Canals, &c. for the Year 1867.

——	Weight.		Weight.	
	Tons.	Cwts.	Tons.	Cwts.
Sent from the North Wales District.				
Carried on Freight.				
From Black Park to North Wales	1,338	5		
„ Pontsticill to Shropshire	1,409	9		
			2,747	14
On Toll.				
From Pontsticill and neighbourhood to Montgomeryshire	35,869	15		
„ „ „ Shropshire	29,698	0		
„ „ „ Cheshire	2,599	0		
			68,166	15
Pontsticill (Mineral Branch) Railway.				
To Shropshire	1,328	10		
„ North Wales	1,843	12		
„ Cheshire	304	6		
			3,476	8
Total from the North Wales District for 1867			74,380	17

The Yorkshire Coalfield, together with that of Derbyshire and Nottinghamshire, Warwickshire, and Leicestershire.

As a coalfield the extension through the five counties may be conveniently regarded as one, especially with reference to the distribution of the coal. The Yorkshire inspection district, now under the charge

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of Mr. Frank N. Wardell, has been divided into the following districts; the production of coal since 1860 having been as follows:— Yorkshire collieries.

—	1860. 387 Collieries.	1861. 397 Collieries.	1862. 418 Collieries.	1863. 415 Collieries.	1864. 422 Collieries.	1865. 434 Collieries.	1866. 447 Collieries.	1867. 454 Collieries.	1868. 441 Collieries.	1869. 413 Collieries.	1870.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Leeds - - Normanton - -	2,459,500	2,225,500	2,195,000	2,198,750	2,120,000	2,250,500	2,215,000	2,225,000	2,505,000	2,839,540	
Bradford - -	1,250,500	1,550,000	1,525,000	1,520,000	1,425,000	1,657,500	1,875,000	1,857,550	1,175,270	651,800	
Huddersfield - -	355,000	325,500	320,500	315,750	317,600	375,500	376,750	384,700	300,500	111,295	
Barnsley - -	2,430,000	2,225,500	2,195,000	2,196,500	1,435,000	1,565,000	1,550,500	1,375,500	1,799,500	2,750,020	
Halifax - - -	375,000	325,550	400,000	425,500	430,500	429,000	419,500	525,750	450,500	90,794	
Wakefield - -	826,000	875,000	825,000	820,000	1,125,000	1,157,000	1,137,500	1,159,500	1,258,470	997,182	
Rotherham - -	493,000	450,000	445,000	450,500	461,000	450,000	448,500	450,000	570,250	1,757,896	
Sheffield - -	651,000	851,000	860,000	950,500	975,500	990,000	1,150,000	1,225,500	1,075,500	830,000	
Dewsbury - - Peniston - - Pontefract - - Bingley - - Saddleworth - - Lettle - -	450,000	476,550	490,000	525,000	520,000	680,600	807,750	546,575	605,520	801,300	
	9,284,000	9,374,600	9,255,500	9,402,500	8,809,600	9,355,100	9,714,700	9,843,575	9,740,510	10,829,827	—

Not complete.

The increase in 1869 over 1860 was 1,545,827 tons, and for the same year over 1865 was 1,474,727 tons, and for 1869 over 1868 was 1,089,317; showing that until the last year named there was a considerable degree of constancy in the annual returns. It should be stated that the differences which appear from year to year in some of the districts arises from the circumstances that the divisions have been altered, the total collieries of Yorkshire remaining, however, undisturbed. Production of coal, 1860 to 1869.

The numbers of the collieries as returned each year by the inspectors are given; but it appears as if, when the changes of inspectors—there have been three such in Yorkshire—have taken place, they have varied their modes of determining them. In some cases the names of pits have been returned as collieries. The difficulty of correcting this would now be very great, and the differences are not sufficiently important to warrant any delay in doing so.

Derbyshire and Nottinghamshire, Warwickshire and Leicestershire.

Derbyshire and Midland collieries.

We have said, for our purpose, it is convenient to treat these districts as one. The coalfield of Yorkshire, Derbyshire, and Nottinghamshire may be treated physically as one. The greatest length of the coalfield from north to south is sixty-six miles, and its breadth, which varies considerably, may be stated to be from five miles to twenty miles. In Derbyshire the principal coals are the "top hard" and "lower hard," producing the valuable splint coal.

The district embracing those four counties is under the inspection of Mr. Thomas Evans.

In 1860, when the late Mr. John Hedley was the inspector, the collieries were returned as follows:—

Derbyshire - - -	153
Nottinghamshire - - -	21
Leicestershire - - -	14
Warwickshire - - -	17
	205 collieries.

In 1869 Mr. Thomas Evans returns—

Derbyshire - - -	140
Nottinghamshire - - -	26
Leicestershire - - -	10
Warwickshire - - -	16
	192 collieries.

It is interesting to be able to refer to the lists of the collieries in Derbyshire and in the immediately adjoining counties, as they were compiled by John Farey in 1811 and by Stephen Glover in 1831; Farey's list giving the names and situation of 283 collieries, and that of Stephen Glover 242 collieries, or together 525 collieries. A careful examination of these lists, and a comparison with the lists of the collieries published in the Appendix for 1869, prove that the number of collieries has not greatly varied, but that the extension of many of the collieries individually has been enormous. Appendix No and No. 20, page 8. Appendix No. page 11.

The production of coal from these Midland coalfields has been as follows since 1860:— Appendix, list of collieries, No. 27, page 26, &c.

—	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Derbyshire - - Nottinghamshire - -	4,940,000	5,116,319	4,534,800 732,666	4,550,750 750,000	4,470,750 796,700	4,595,750 1,095,500	4,750,520 1,600,000	4,550,350 1,575,000	4,957,879 1,508,439	5,460,090 1,575,450	
Leicestershire -	730,000	740,000	696,024	805,750	890,500	965,500	866,650	1,150,000	608,088*	685,630	
Warwickshire - -	545,000	647,000	678,000	685,500	754,000	859,000	775,000	880,850	624,859	650,700	
Total - -	6,215,000	6,503,319	6,641,490	6,792,000	6,911,950	7,515,750	7,992,840	8,156,400	7,699,265	8,271,870	

Not complete.

* In this year and the following seven collieries, which were included in the returns for Leicestershire, are included in those for Derbyshire.

The total increase of 1860 over 1869 being 2,056,870; but between 1865 and 1869 the increase was only 756,120 tons.

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The distribution of the coal from the YORKSHIRE and the MIDLAND COUNTIES coalfields will be satisfactorily shown in the following returns; those of the railways and canals having been most obligingly forwarded by the managers, with the consents of the directors of the works respectively.

Appendix Nos. 82 to 87, page 88.

SHIPMENTS of COAL from YORKSHIRE COALFIELDS since 1850. (*For detailed tables, see Appendix.*)

—	Gainsborough Shipments.	Scarborough Shipments.	Hull Shipments.	Goole Shipments.	Grimsby Shipments.	Boston Shipments.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	93,389	190	1,097,344	1,006,845	451,346	1,264	2,650,378	377,32
1861 to 1869	134,644	180	1,703,363	968,498	1,656,613	3,504	4,466,802	1,816,424
Totals -	228,033	370	2,800,707	1,975,343	2,107,959	4,768	7,117,180	2,193,753

The distribution of this coal coastwise and foreign has been,—

—		Coastwise.	Foreign.	Total.
		Tons.	Tons.	Tons.
In the years from 1851 to 1860 -	Gainsborough -	89,874	3,515	93,389
	Scarborough -	—	190	190
	Hull - -	110,174	987,170	1,097,344
	Goole - -	933,634	73,211	1,006,845
	Grimsby -	36,385	414,961	451,346
	Boston - -	110	1,154	1,264
In the years from 1861 to 1869 -	Gainsborough -	127,417	7,227	134,644
	Scarborough -	180	—	180
	Hull - -	135,688	1,567,675	1,703,363
	Goole - -	851,449	117,049	968,498
	Grimsby -	232,026	1,424,587	1,656,613
	Boston* - -	2,217	1,287	3,504

* For seven years.

Appendix, No. 88, page 90, In the Appendix will be furnished a table showing the quantities of coal received by river and railway at Hull from 1865 to 1869.

The RAILWAY DISTRIBUTION from the YORKSHIRE and MIDLAND COUNTIES COALFIELD.

MIDLAND RAILWAY.—The following quantities of Coal were conveyed over the Midland system from the Yorkshire coalfield in the year 186 , and the following quantities were distributed between—

	Tons.
Morecambe and Gargrave - - - - - -	23,649
Gargrave and Colne - - - -	868
Gargrave and Leeds - - - - - -	245,286
Leeds and Normanton - - - -	100,277
Mexborough and Swinton - - - - -	4,957
Mexborough and Beighton Junction - - -	74,604
Derby and Hampton - - - - - -	298
Castle Bromwich and Blackwell - - -	79
Broomsgrove and Worcester - - - - -	183
Cheltenham and Bristol - - - -	670
Nottingham and Lincoln - - - - -	1,239
Mansfield and Radford - - - -	1,594
Toton and Syston - - - - - -	1,369
Brooksley and Peterborough - - - -	114,550
Eye and Clenchwarton - - - - -	2,798
Leicester and Bagworth - - - -	2,413
Glen and Hitchen - - - - - -	9,340
Twywell and Cambridge - - - -	1,938
Sheffield receives - - - - - -	237,778
Tewkesbury receives - - - - -	736
Rugby receives - - - - - - -	11
Northampton receives - - - - -	126
St. Pancras receives - - - - - -	3,706
Total - -	828,482

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Great Northern Railway.

GREAT NORTHERN RAILWAY.—COALS and COKE CONVEYED over the GREAT NORTHERN SYSTEM from the WEST RIDING PITS in the year 1860 was 409,626 tons, and 9,893 tons were conveyed to other lines.

The quantity distributed between—

	Tons.
King's Cross and Arksey, was	18,794
Peakirk and Saxilby, was	5,100
Sibsey and Holton-le-Clay, was	1,104
Hertford and Dunstable, was	423
Baldock and Cambridge, was	114
Bedford and Cambridge, was	82
Honington and Hubert's Bridge, was	1,597
Twenty and Sutton Bridge, was	818
Adwick and South Elmsall, was	2,360
Wakefield and Dudley Hill, was	377,574
St. Alban's receives	101
Bourn receives	9
Nottingham receives	1,550
Horncastle receives	354
Total	409,626

The quantity of coal and coke from the WEST RIDING PITS conveyed in the same year to various stations on the Great Northern line for further transit by other railways.

	Tons.
To Ardsley, for the North-eastern	403
To Halifax, for the Lancashire and Yorkshire	2,800
To Peterborough, for the Great Eastern	5,814
To London, for the London, Brighton, and South Coast	28
To London, for the London, Chatham, and Dover	9
To London, for the North London	83
To London, for the London and South-western	756
Total	9,893

The coal conveyed over the GREAT NORTHERN RAILWAY system from the SOUTH YORKSHIRE pits was 497,418 tons in 1866, and 273,270 tons were conveyed to other lines.

This quantity was distributed between—

	Tons.
King's Cross and Arksey	367,645
Peakirk and Saxilby	43,365
Sibsey and Holton-le-Clay	29,793
Springfield and St. Albans	944
Hertford and Dunstable	9,580
Baldock and Cambridge	6,588
Bedford and Cambridge	3,402
St. Mary's and Ramsey	575
Sedgebrook and Nottingham	5,327
Honington and Hubert's Bridge	5,609
Twenty and Sutton Bridge	11,192
Stamford receives	2,258
Horncastle receives	10,292
Total	497,418

The quantity of coal and coke from the SOUTH YORKSHIRE pits conveyed to various stations on the Great Northern line for further transit by other railways was 273,270 tons.

	Tons.
Sent to Peterborough for the Great Eastern	57,934
Sent to Retford for Grimsby for export	202,348
Sent to London for the London, Brighton, and South Coast	3,478
Sent to London for the London, Chatham, and Dover	832
Sent to London for the North and South-western Junction	1,507
Sent to London for the North London	2,229
Sent to London for the London and South-western	4,942
Total	273,270

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Great Northern Railway, 1867, 1868.

The Great Northern Railway carried in 1867 and 1868 the following quantities of coal from the pits of the WEST RIDING of YORKSHIRE and from SOUTH YORKSHIRE, as follows:

	West Riding.			South Yorkshire.		
	1867.	1868.	1869.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
To stations between London and Hatfield inclusive	12,467	7,145	6,088	307,352	253,468	119,585
Welwyn and Peterboro' inclusive	8,857	5,949	6,362	171,634	122,567	125,456
Tullington and Arksey inclusive	15,309	11,807	9,320	43,489	48,422	38,109
Peakirk and Lea inclusive	6,728	6,237	5,580	66,965	62,550	73,384
Doncaster and Gainsboro' inclusive	118	284	214	5,111	7,442	7,636
Doncaster and Halifax inclusive	410,957	369,066	397,506	—	—	—
East Lincolnshire	1,722	295	508	31,668	27,290	25,970
Total	455,888	400,783	425,578	626,219	521,739	470,140

	Tons.		Tons.		Tons.
In 1867	455,888	In 1868	400,783	In 1869	425,578
„	626,219	„	521,739	„	470,140
Total from Yorkshire	1,082,107		922,522		895,718
		Decrease	159,585	Decrease	26,804

London and North-Western Railway.

The LONDON and NORTH-WESTERN Railway carried in 1867 from YORKSHIRE 183,374 tons of coals. These were distributed for the most part as follows (small quantities being omitted) :—

		Tons.
Batley,	Yorkshire	2,283
Berry Brow,	Do.	4,189
Birstal	Do.	588
Bradford,	Do.	6,449
Brighouse,	Do.	545
Brockholes,	Do.	758
Copley Hill,	Do.	20,348
Dewsbury,	Do.	1,223
Delph,	Do.	7,302
Diggle,	Do.	4,035
Elland,	Do.	331
Greenfield,	Do.	2,700
Grotton,	Do.	9,355
Halifax,	Do.	7,323
Holmfirth,	Do.	3,833
Honley,	Do.	5,387
Huddersfield,	Do.	21,440
Leeds,	Do.	23,959
Lees,	Lancashire	5,581
Lockwood,	Yorkshire	5,224
Longwood,	Do.	14,156
Low Moor,	Do.	870
Luddenden Foot,	Do.	391
Marsden,	Do.	6,670
Mirfield,	Do.	588
Moseley,	Worcester	10,636
Saddleworth,	Yorkshire	1,948
Slaitwaite,	Do.	16,171
Sowerby Bridge,	Do.	3,808
Thong's Bridge,	Do.	479
Thodmorden,	Lancashire	1,963
Wortley,	Yorkshire	2,165

LONDON AND NORTH-WESTERN RAILWAY.

The Yorkshire coals conveyed over the LONDON AND NORTH-WESTERN from the Yorkshire coalfield in 1865 was 153,121 tons, and in 1867 it was 151,270 tons.

	Tons.
The quantity distributed between Crewe and Leeds was	151,199
London receives	58
Longsight receives	6
Manchester receives	7
Total	151,270

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The LONDON AND NORTH-WESTERN Railway in 1868 received from the Yorkshire coalfields the following quantities:—

	Tons.
To stations east of Manchester	14
Between Manchester and Leeds	160,489
For Macclesfield branch	313
Between Birmingham and Rugby	6
On the Bletchley and Cambridge branch	19
Between Rugby and London exclusive of London	56
London	14
	166,911
To Foreign lines	29,821
Total	196,732

They received for the Lancashire and Yorkshire line	29,808 tons
London, Brighton, and South Coast do.	13 „
Total	29,821

Coal conveyed over the London and North-western for the LANCASHIRE AND YORKSHIRE Railway. From the Yorkshire coalfield was 42,090 tons.

	Tons.
The quantity distributed between Huddersfield and Peniston, was	19,870
Fleetwood and Normanton	21,989
Oldham receives	231
Total	42,090

Coal conveyed over the London and North-western for the NORTH-EASTERN Railway. From the Yorkshire coalfield, was 14 tons.

The Yorkshire coal is distributed as far north by the London and North-western system as Dacre, and as far south as London.

NORTH-EASTERN RAILWAY.

North-eastern Railway, 1858 to 1869.

QUANTITIES of Coal carried from Yorkshire and Lancashire Collieries for Consumption at Places on the North-eastern Railway in each of the following Years, and including Shipments from Hull and Selby.

	Tons.		Tons.
1858	341,375	1864	456,320
1859	334,835	1865	469,080
1860	412,097	1866	527,887
1861	403,825	1867	581,708
1862	391,097	1868	606,689
1863	361,859	1869	675,378

STATEMENT showing the quantity of COAL, &c. conveyed by the North-eastern Railway Company during the Year 1866 from the Yorkshire Coalfield.

North-eastern Railway.

——	Coal.
	Tons.
Quantity of coal carried from collieries on North-eastern line to stations on North-eastern Railway for manufacturing and household purposes	360,177
Coal from collieries situated on other companies' lines brought on for consumption at places on the North-eastern line—	
Viâ Knottingley	5,998
Normanton	59,864
Leeds	21,588
Coal from collieries on North-eastern line conveyed to Hull for shipment	79,955
Coal from collieries beyond North-eastern line passing over North-eastern line (viâ Normanton) to Hull for shipment	195
Coal from collieries on North-eastern line carried to Selby for shipment	110
Total	527,887

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The NORTH-EASTERN Railway carried the following Quantities of Coal from the YORKSHIRE and LANCASHIRE Collieries (principally from the former; it is not possible to separate them) :—

——	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1. For consumption at places on the North-Eastern Railway - -	354,385	344,739	330,198	324,518	389,334	398,135	447,637	—	515,475	577,519
2. For shipment at Hull - - - -	57,502	58,648	60,739	37,302	66,767	7,916	80,150	—	89,383	94,506
3. Ditto Selby - - -	210	438	159	39	219	29	110	—	1,831	3,282
4. Ditto Goole - - - -	—	—	—	—	—	—	—	—	—	71
	412,097	403,825	391,096	361,859	456,320	406,080	527,897	—	606,688	675,378

Cambrian Railway.

The CAMBRIAN Railway carried from the LEEDS DISTRICT in 1868, 105 tons. Of this Quantity, Oswestry received 61 tons, and Llanidloes 44 tons.

CANALS.

CANALS.—The coal carried from the Barnsley district by canal passes by the "Barnsley canal" and the "river Dun" to Hull and Goole, chiefly for shipment. "The Aire and Calder" canal also carries this coal to Wakefield and Leeds.

River Dun.

The river Dun is now in the hands of the Manchester, Sheffield, and Lincolnshire Railway. The coal carried by it is principally for Sheffield and to Hull for shipment. Some portion passes by the river Trent to Lincoln and other places.

Leeds and Liverpool Canal.

The LEEDS and LIVERPOOL CANAL received and forwarded of Yorkshire coal as follows in 1868:

Yorkshire coal forwarded.	Tons.
To Apperley - - - - -	31
Buck Mill - - - - -	43
Long Jug - - - - -	20
Leeds - - - - - -	162,220
Riddlesdew - - - -	24
Rishworth - - - - -	32
Shipley - - - - -	42
Skipton - - - - -	3
Stockbridge - - - -	95
Wellington Bridge - - - -	25
	162,535

Aire and Calder.

The AIRE and CALDER navigation carries the coal from the Yorkshire coalfield for exportation to places on the Ouse, Derwent, Humber, coast and foreign, which amount to about half a million tons; in which is also included the coal loaded on the BARNSLEY canal, except upwards of forty thousand tons passing into the Dearne and Dove canal. Beyond this there is coal carried by he Calder and Hebble navigation to the extent of more than 150,000 tons.

The following statements have reference to the quantities of coal passing to H ill by the railway systems and by inland navigation.

River Dun Navigation.

STATEMENT of tons of COAL and COKE carried on the RIVER DUN NAVIGATION, from 1761 to 1850 inclusive :—

	1761 to 1770.	1771 to 1780.	1781 to 1790.	1791 to 1800.	1801 to 1810.	1811 to 1820.	1821 to 1830.	1831 to 1840.	1841 to 1850.
1	24,374	47,115	28,865	33,328	37,277	55,113	51,468	77,334	320,476
2	27,718	44,103	31,289	36,889	37,368	54,105	54,481	84,110	359,504
3	29,330	42,856	33,644	34,363	35,035	57,453	56,036	71,970	369,393
4	31,179	44,730	29,522	35,037	41,668	59,069	60,272	73,238	384,682
5	33,066	43,509	34,856	35,726	42,787	55,178	70,406	74,342	349,886
6	36,472	38,118	32,505	35,859	49,374	59,219	67,911	221,458	370,438
7	32,059	41,442	35,832	39,502	48,836	55,481	62,111	278,281	445,934
8	33,540	39,755	33,001	37,778	49,926	58.727	66,075	248,136	442,607
9	42,705	35,191	42,595	37,615	52,468	51,672	67,612	267,191	397,336
10	42,104	34,753	33,617	41,015	56,525	63,819	68,981	312,294	366,411
Total -	337,547	411,572	340,726	367,112	451,264	569,836	625,353	1,708,354	3,806,667

Erewash Valley.

THE EREWASH VALLEY CANAL AND RAILWAY.

See Appendix No. 91, page 92.

The uniform increase in the trade in coal, as shown by the Erewash Valley returns, in the first instance, from 1803, when 254,268 tons were passed by canal, to 1848, when 42,670 tons were returned, proves that the rate of increase is a very gradual one.

Between 1803 and 1819 there was scarcely any change in the quantity carried. In 1820 313,877 tons passed over the canal, in 1830 it had fallen to 253,498 tons, in 1840 the quantity had

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advanced to 420,418 tons, and in 1848 it was but 427,678 tons. In 1849, 430,775 tons were carried; but in this year the railway traffic begins, and we have the following returns for each tenth year :—

Appendix, No. 90, p. 91. Erewash Valley.

Years.	Canal.	Railway.	Total.
	Tons.	Tons.	Tons.
1849	386,955	43,820	430,775
1859	208,905	968,026	1,176,931
1869	192,902	1,709,061	1,901,963

These figures, and still more completely the detailed table in the Appendix, show how gradually the coal traffic passed from the canal to the railway.

The total sales of the collieries within the Association of Coal Owners in Derbyshire, that is, those of the Erewash Valley of Derbyshire and Leicestershire, were as follows:

——	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
Erewash Valley - -	1,843,397	1,825,798	1,634,624	1,901,963
North Derbyshire - -	450,515	503,137	517,384	221,806
South „ - -	—	128,381	165,210	598,086
Leicestershire - - -	658,876	596,988	536,294	559,377
	2,952,788	3,054,304	2,853,512	3,281,232

While dealing with the canal distribution of the Midland coal, the deliveries in 1867 by the canal to Cromford may be noted as showing a limited circle of distribution.

Cromford Canal.

Cromford Canal.

Total amount of Coal delivered at the under-mentioned places, year ending December 31st, 1867.

Places of Delivery.	Boats.	Hard.	Soft.	Cobbles.	Cokes.	Total.
		Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
Cromford - - -	546	807 10	2,313 10	8,005 10	—	11,126 10
Railway - - - -	154	1,054 10	149 15	1,997 0	7 0	3,208 5
Lea - - -	150	—	1,487 10	2,045 5	—	3,532 15
Whatstandwell - -	160	350 5	1,447 5	1,409 10	—	3,207 0
Hagturn - - -	390	4,274 10	—	—	2,492 15	6,767 5
Saw Mill - - -	7	—	—	144 5	—	144 5
Bull Bridge - -	1	—	23 0	—	—	23 0
	1,408	6,486 15	5,421 0	13,601 10	2,499 15	28,009 0

Appendix, No. 92, page 93, for detailed return.

The quantity of coal passing on the Ashby Canal in 1868 being 124,738 tons, or in each month as follows:—

Ashby-de-la Zouch Canal. 1868.

Statement of Coal passing over the Ashby Canal, January to December 1868 inclusive.

	Tons.	Cwt.
January - - - - -	11,077	0
February - - - -	11,618	10
March - - - - -	9,896	0
April - - - -	9,588	10
May - - - - -	11,831	0
June - - - -	6,884	10
July - - - - -	8,963	0
August - - - -	9,978	0
September - - - -	11,445	0
October - - - -	12,364	10
November - - - -	10,826	10
December - - -	11,265	10
Total - - -	124,738	0

The Leeds and Liverpool canal carried in 1868 from the Yorkshire collieries 203,070 tons, the details of the distribution of which were as follows:—

Leeds and Liverpool Canal 1868.

Leeds and Liverpool Canal.

Coals received at the following Places, 1868.

Yorkshire.

Yorkshire coals.	Tons.
Apperley - - - - -	10,734
Bank Newton - - - - -	9

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Yorkshire Coals.	Tons.
Bingley	5,880
Brackendale	1,923
Boothbridge	10
Bradley	1,222
Cononley	203
Dubb	9,679
Forge	6,369
Gargrave	4,730
Highgate	3
Hirstmill	36
Juga Bridge	202
Junction, Leeds	4,894
Kildwick	3,743
Lodge Hill	5
Long Jug	2,334
Marton	878
Oddy Locks	871
Ray Bridge	4,151
Riddlesdew	8,655
Rishworth	7,084
Rodley	16,298
Ross Mill	278
Rustall	1,958
Shipley	22,350
Salterforth	1,632
Skipton	25,015
Silsden	6,912
Southfield	152
Stockbridge	20,297
Thorlby	52
Wellington Bridge	19,111
Leeds	15,400
Total	203,070

The following quantities of coal were received at Hull from the coalfields of Yorkshire:—

Years.	By Navigation.*			By Railway.		
	Export.	Home.	Total.	Export.	Home.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
July 1865	154,024	86,086	240,110	12,586	19,196	61,782 half year.
to 1866	323,924	203,470	527,394	81,505	47,665	129,170 year.
December 1867	300,300	196,340	499,640	75,677	49,284	124,961 year.

* This will have passed by the Aire and Calder as stated, page 93.

Distribution of coal from Hull.

The Hull Chamber of Commerce furnishes the following information as to the distribution of the coal received at Hull:—

RETURN of COAL received at Hull, and Destination in 1867.

Quantity received - - - - - 624,601 tons.

	Tons.
Quantity used for manufacturing purposes	91,528
„ for domestic purposes	154,097
„ for steam-ships' use and export	378,976
	624,601

RETURN of COAL received at Hull and its Destination in 1868.

Quantity received - - - - - 610,729 tons.

	Tons.
Quantity used for manufacturing purposes	117,387
„ for domestic purposes	100,259
„ for steam-ships' use and export	393,083
	610,729

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And the following for 1869:—

	Tons.
Shipped on board steamers for use	203,864
Ditto ditto for *export*	58,344
Ditto ditto for coasting and foreign markets	123,212
	385,420

Chamber of Commerce, Hull, 17 Aug. 1869,
P. Bruce, Secretary.

Lancashire and Yorkshire Railway.

The Lancashire and Yorkshire Railway carried during 1866 a total quantity from all the stations on the line of 2,908,998 tons.

The following quantities were forwarded from the stations in Yorkshire. (Small quantities from the less important stations are omitted).

	Tons.
Shipley	13,590
Mirfield	14,382
Heckmondwicke	15,564
Liversedge	18,570
Cleckheaton	1,085
Low Moor	22,234
Bradford	1,268
Thornhill, for Dewsbury	72,103
Horbury	22,867
Do. Junction	4,896
Darton	103,778
Haigh	151,518
Crigglestone	17,352
Barnsley	227,995
Wakefield	43,825
Normanton	59,793
Whitwood	14,599

RAILWAY DISTRIBUTION of Yorkshire and Midland Counties Coal.

We are enabled to examine with satisfactory accuracy the increase in the coal traffic of an important railway company of which we have returns for the years 1856 and 1866.

1856.

Midland Railway.

The Midland Railway carried from the collieries North of Derby, the Erewash Valley ollieries, and the Leicestershire collieries, 1,212,052 tons.

This coal was distributed as follows:—

Yorkshire collieries, 1856

Yorkshire Collieries.

	Tons.
From Ingleton	33
„ Colne	4,562
„ Bradford	11,698
„ Leeds	7,515
„ Rothwell Haigh	60,146
„ Woodlesford	3,694
„ North-eastern Railway Company, Altofts	49,339
„ Normanton for Barnsley	25,587
„ Swinton	32,197
„ Kilnhurst	96,221
„ Park Gate	8,353
„ Sheffield	266
„ Woodhouse Mile	15,152

Derbyshire collieries, 1856.

Derbyshire Collieries.

From Eckington	3,023
„ Staveley	195,754
„ Locoford	35,826
„ Chesterfield	14,540
„ Wingerwork	9,628
„ Clay Cross	200,357
„ Stretton	9,654
„ Wingfield	18,784
„ Ambergate	704
„ Marehay	41,360
„ Denby	8,411
„ Kilburn	4,063
„ North-eastern Railway Company, Willington	540
„ Lincoln	69

The distribution of the above will be seen in the Appendix. Appendix, No. 89, page 91.

The London stations received	117,268 tons.
The Kew Junction for South-eastern and South-western Railways	40,364 „

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Midland Railway, 1856.

From the EREWASH VALLEY COLLIERIES in 1856 the Midland Railway carried 867,288 tons, as follows:—

	Tons.
From Sutton	76
„ Pinxton	145,405
„ Coates Park	98,829
„ Portland	75,680
„ Pye Bridge	15,432
„ Codnor Park	133,929
„ Stoneyford	22,709
„ Langley Mile	95,162
„ Heanor	115,718
„ Shipley Gate	79,859
„ Bennerly	17,954
„ Ilkeston	26,945
„ Basford	39,542
Total	867,288

This coal was distributed as shown in Appendix.

The London stations receiving 240,205 tons, and Kew Junction for the South-eastern and South-western Railway 105,717 tons.

See Appendix, Table No. 89, page 91, for a further and more detailed return.

The MIDLAND RAILWAY in 1856 received from the LEICESTER and BURTON COLLIERIES as follows:—

	Tons.
From Burton	257
„ Swadlincote	84,212
„ Moira	108,725
„ Coalville	281,702
„ Bagworth	12,135
Total	487,230

This coal was distributed as detailed in Appendix.

	Tons.
The London stations receiving	2,081
Kew Junction for South-eastern and South-western Railway	8,517

YORKSHIRE and MIDLAND collieries.

The MIDLAND RAILWAY conveyed from the Yorkshire and Midland Counties Collieries in 1866 as follows:—

	Tons.
From Yorkshire	968,600
„ Derbyshire	3,135,855
„ Nottinghamshire	197,873
„ Warwickshire	74,751
„ Leicestershire	865,240

Derbyshire coalfield.

From the Derbyshire coalfield 1,560,069 tons were distributed as follows; between

	Tons.
Lancaster and Leeds	301
Normanton and Stretton	125,063
Duffield and Buxton	76,464
Blackwell Mill Junction and Ripley	37,006
Derby and Hampton	213,989
Forge Mills and Redditch	72,209
Broomsgrove and Worcester	9,309
Droitwich and Ashchurch	1,964
Beckford and Alcester	1,021
Tewkesbury and Malvern Wells	1,034
Cheltenham and Bristol	21,143
Spondon and Lincoln	135,447
Doe Hill and Alfreton	1,116
Mansfield and Lenton	67,497
Pye Bridge and Syston	117,538
Brooksley and Peterborough	305,581
Eye and Clenchwarton	3,144
Leicester and Swadlincote	16,607
Brington and Rugby	82,718
Wigston and Hitchin	88,627
Cranford and Huntingdon	5,566
Sheffield receives	68,836
Northampton receives	907
St. Pancras receives	105,541
Total	1,560,069

The above quantities are delivered at stations situated on the Midland system.

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Nottinghamshire coalfield.

The coals distributed by the Midland system from the NOTTINGHAMSHIRE coalfield was 91,796 tons. This quantity was distributed between

	Tons.
Matlock Bath and Bakewell	112
Derby and Barton Walton	415
Birmingham and Mosely	24
Beeston and Lincoln	20,724
Newstead and Lenton	10,323
Sandacre and Syston	5,176
Brooksley and Peterborough	49,333
Eye and Wisbeach	184
Wigstone and Hitchin	3,664
Cranford and Brampton	336
Gloucester receives	12
Leicester „	149
Broughton „	94
St. Pancras „	1,550
Total	91,796

Warwickshire coalfield.

The coals carried on the Midland system from the WARWICKSHIRE coalfield was 60,001 tons, and the quantities delivered

	Tons.
Between Derby and Hampton is	12,575
„ Forge Mills and Blackwell is	20,012
„ Broomsgrove and Worcester is	360
„ Droitwich and Ashchurch is	893
„ Ashton and Salford Priors is	16
„ Cleeve and Bristol is	14,742
„ Basford and Radford is	2,197
„ Stanford and Peterborough is	83
„ Nuneaton and Shustoke is	2,696
„ Ketterington and Cardington is	84
Nottingham receives	5,568
Shrapstone „	11
St. Pancras „	767
Total	60,001

Leicester coalfield.

The coal carried on the Midland system from the LEICESTERSHIRE coalfield was 567,457 tons. The quantity delivered between

	Tons.
High Peak and Darley Dale was	73
Derby and Hampton was	99,863
Forge Mills and Blackwell was	51,048
Broomsgrove and Worcester was	38,097
Droitwich and Ashchurch was	9,594
Becksford and Alcester was	10,290
Tewkesbury and Malvern Wells was	4,055
Cleeve and Bristol was	116,396
Nottingham and Lincoln was	183
Toton and Syston was	6,754
Ashforby and Peterboro' was	12,542
Wryde and Tydd St. Mary	88
Leicester and Moira was	173,693
Broughton and Rugby was	14,985
Cranford and Huntingdon was	2,845
Wigston and Hitchin was	43,840
Bradford receives	6
St. Pancras „	22,693
Northampton receives	412
Total	567,457

Yorkshire coalfield.

From the YORKSHIRE coalfield the MIDLAND RAILWAY carried for stations on the London and North-western Railway 54,944 tons. These were distributed as follows:—

	Tons.
Between London and Bletchley	35,795
„ Aylesbury and Farthinghoe	209
„ Oxford and Cambridge	9,812
„ Roade and Rugby	129
„ Leamington and Uffington	84
„ Peterborough and Northampton	435
„ Tebay and Kirkby Lonsdale	4,142
„ other places	4,838
Total	54,944

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Midland for Great Northern Railway.

The Yorkshire coals conveyed over the Midland for stations on the Great Northern was 15,055 tons.

The quantity distributed between—

	Tons.
London and Peterborough was	14,172
Peterboro' and Great Grimsby was	77
Peterboro' and Retford was	506
Boston and Jericho	120
Welwyn and Dunstable was	92
Horncastle receives	29
Royston „	59
Total	15,055

Midland for Great Eastern Railway.

The quantity of coals from YORKSHIRE conveyed over the MIDLAND for stations on the GREAT EASTERN SYSTEM was 49,367 tons.

This quantity was delivered as follows:—

	Tons.
Between Yarmouth and London is	24,144
„ Woolwich and Norwich is	9,461
„ Ipswich and Norwich is	3,764
„ Norwich and Lowestoft is	2,500
„ Beccles and Tivetshall is	816
„ Washington and St. Ives and Ely	1,417
„ Ely and Hunstanton is	767
„ Wymondham and Wells is	707
„ Dereham and King's Lynn is	380
„ Elmswell and Huntingdon is	1,126
„ Marks Tey and Bury and Shelford	2,265
„ Chapel and Haversbill	171
„ Southend and London	353
„ London and Chipping-Ongar	1,494
Total	49,367

Midland for Great Western.

Coals conveyed over the Midland Railway from YORKSHIRE for stations on the GREAT WESTERN Railway was 13,848 tons.

The quantity distributed between—

	Tons.
London and Shrivenham was	13,718
Wycombe receives	40
Stratford „	13
Pershore „	7
Basingstoke „	70
Total	13,848

Midland for London, Brighton, and South Coast.

The quantity of coal conveyed over the Midland for stations on the LONDON, BRIGHTON, and SOUTH COAST from the Yorkshire coalfield was 6,170 tons.

The quantity delivered between—

	Tons.
London and Brighton was	4,435
Hastings and Portsmouth was	301
Littlehampton and Tunbridge Wells was	653
Shoreham and Guildford was	19
London and Leatherhead was	762
Total	6,170

Midland for London, Chatham, and Dover Railway.

The coals conveyed over the Midland Railway for stations on the LONDON, CHATHAM, and DOVER line was 256 tons.

This quantity was delivered between—

	Tons.
Dover and London	212
While Seven Oaks receives	44
Total	256

The coal conveyed over the Midland Railway from Yorkshire for stations on the North London line was 268 tons.

This coal from the Yorkshire coalfield is distributed by the Midland Railway as far north as Tebay, as far south as Brighton, east as Yarmouth, and west as Bristol.

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Manchester, Sheffield, and Lincolnshire Railway.

Manchester, Sheffield, and Lincolnshire Railway.

Coal conveyed by the Manchester, Sheffield, and Lincolnshire Railway to Grimsby for Great Northern Stations, 8,430 tons.

Statement showing the Weight of Coal forwarded from the Manchester, Sheffield, and Lincolnshire Stations during the 12 Months from November 1st, 1865, to October 31st, 1866.

District from which the Coal is obtained.	Station from which sent.	Weight.
		Tons.
Yorkshire	Dunford Bridge	13,708
Barnsley	Silkstone	84,887
	Dodworth	14,964
	Barnsley	39,186
	Thurgoland	21,666
Sheffield	Woodhouse	192,379
Chesterfield	Beighton	27,350
Shireoaks	Shireoaks	138,857
Chesterfield	Lincoln	3,198
South Yorkshire	Retford	197,112
	Keadby	65,409
	Hexthorpe	705,048
	Mexbro'	105,181
	Elsecar	29,366
	Wombwell	36,305
	Worsboro'	58,688
	Ardsley	6,593
	Barnsley	6,821
	Birdwell	40,872
	Westwood	10,737
	Chapeltown	6,402
	Grange Lane	4,656

During the 12 months ending 1869 the same line carried from Yorkshire as follows. These two tables show the changes which took place within the three years given:—

District from which the Coal is obtained.	Station from which sent.	Weight.
		Tons.
Yorkshire	Dunford	13,233
Barnsley	Penistone	20
	Silkstone	72,643
	Dodworth	19,975
	Barnsley	43,533
	Thurgoland	11,401
Sheffield	Sheffield	3,087
	Woodhouse	296,443
Chesterfield	Beighton	26,793
Worksop	Kineton Park	53,621
Shireoaks	Shireoaks	210,512
Chesterfield	Lincoln	2,530
South Yorkshire	Keadby	274,180
	Hexthorpe	664,053
	Mexboro'	209,729
	Wath	3,516
	Elsecar	40,898
	Wombwell	65,659
	Worsboro'	89,921
	Ardsley	32,218
	Barnsley	2,346
	Birdwell	109,475
	Westwood	9,415
	Chapeltown	21,179
	Grange Lane	16,971
	Broughton Lane	9,656

Of this quantity 1,311,536 tons of coal were delivered at the stations of the Manchester, Sheffield, and Lincolnshire Railway.

The Manchester, Sheffield, and Lincolnshire Railway in 1866 brought to Retford for reconsignment to the Great Northern:—

		Tons.
To stations between	King's Cross and Arksey	24,764
" "	Peakirk and Saxiby	6,394
" "	East Lincolnshire line	7,474
" "	Hatfield and St. Alban's	183

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Manchester, Sheffield, and Lincolnshire to Retford.

		Tons.
To stations between	Hertford and Dunstable	444
„ „	Hitchin and Royston	603
„ „	Bedford and Cambridge	507
„ „	Ramsey Branch	575
„ „	Ryhall and Stamford	35
„ „	Bourne	7
„ „	Boston and Sleaford	1,938
„ „	Bourne and Lynn	1,937
„ „	Horncastle Branch	2,845
For further transit by other railway companies:—		
Peterboro, for the Great Eastern Company's stations		34,765
Retford, to be conveyed to Grimsby for export		—
London, for the London, Brighton, and South Coast Railway		750
London, for the London, Chatham, and Dover Company's stations		555
London, for the North London Railway Company's stations		3,248
London, to Kew Junction, for the London and South-western Railway Company's stations		120
	Total	86,638

Derbyshire coalfield.

Derbyshire Coal.

The coals conveyed over the Midland Railway from Derbyshire to be delivered at stations on the London and North-Western Railway was 553,716 tons.

This quantity was delivered as follows:—

		Tons.
Between	London and Bletchley	334,555
„	Aylesbury and Farthinghoe	15,610
„	Oxford and Cambridge	26,742
„	Roade and Rugby	113,914
„	Leamington and Uffington	11,515
„	Peterborough and Northampton	4,282
„	Dove Holes and Chapel le Frith	1,396
„	Other places	45,702
	Total	553,716

Of Derbyshire coal over the Midland Railway for stations on the Great Northern Railway, 464,326 tons were delivered as follows:—

		Tons.
Between	Grantham and Nottingham	5,528
„	Welwyn and Dunstable	17,025
„	Hitchin and Foxton	1,492
„	London and Peterboro'	371,214
„	Spalding and Sutton Bridge	976
„	Peterborough and Great Grimsby	12,463
„	Peterborough and Retford	31,648
„	Boston and Jericho	22,537
„	Boston and Lincoln	1,443
	Total	464,326

The Derbyshire coals conveyed over the Midland Railway for stations on the Great Eastern System amounted to 131,076 tons.

This quantity was delivered as follows:—

		Tons.
Between	Yarmouth and London	45,476
„	Lowestoft and Norwich	3,461
„	Beccles and Tivetshall	721
„	Norwich and Ipswich	3,815
„	Wymondham and Wells	3,070
„	Dereham and King's Lynn	756
„	Hunstanton and Ely	7,446
„	Wathington and Ely and St. Ives	11,846
„	Norwich and Woolwich	29,533
„	Elmswell and Huntingdon	12,336
„	Marks Tey and Bury and Shelford	6,664
„	Chapel and Haverhill	1,609
„	Southend and London	707
„	Chipping Ongar and London	3,436
	Total	131,076

Derbyshire coal conveyed by the Midland Railway Company to Hitchin for London, 2,672 tons.

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The Derbyshire coals conveyed over the MIDLAND for stations on the GREAT WESTERN SYSTEM was 73,092 tons. Midland for Great Western Railway.

This coal was delivered—

	Tons.
Between Didcot and Worcester	9,479
„ London and Shrivenham	51,225
„ Honeybourne and Birmingham	3,144
„ Hatton and Oxford	2,339
„ Reading and Hungerford	354
„ Maidenhead and Oxford	573
„ Basingstoke and Reading	5,978
Total	73,092

The Derbyshire coal conveyed over the Midland for stations on the NORTH STAFFORDSHIRE Line amounted to 32,694 tons. Midland for North Staffordshire Railway.

The quantity distributed between—

	Tons.
Egginton and Macclesfield was	2,531
Uttoxeter and Congleton	26,260
Ashbourne and Rocester	2,590
Stoke and Crewe	713
Total	32,694

The Derbyshire coal conveyed over the Midland for stations on the LONDON, BRIGHTON, AND SOUTH COAST was 186,767 tons.

This quantity was distributed between—

	Tons.
Hastings and Portsmouth	48,643
Littlehampton and Tunbridge Wells	8,735
Shoreham and Guildford	2,079
Brighton and London	114,185
London and Leatherhead	13,125
Total	186,767

The Derbyshire coal conveyed over the Midland for stations on the LONDON, CHATHAM, AND DOVER Railway was 9,744 tons.

The quantity delivered between—

	Tons.
London and Dover was	1,189
Broadstairs and Herne Bay	146
Eyensford and Sevenoaks	8,409
Total	9,744

The Derbyshire coal conveyed over the Midland for stations on the NORTH LONDON Line was 122,916 tons.

The coal from the DERBYSHIRE coalfield is carried by the Midland as far north as Bilton, as far south as Brighton, as far east as Yarmouth, and as far west as Bristol.

The LONDON AND NORTH-WESTERN received from the DERBYSHIRE coalfield, in 1865, 24,982 tons; and in 1868 this line received and delivered to stations between Manchester and the Macclesfield branch, 53,476 tons; and carried for the Midland Railway, 348 tons. London and North-western Railway for Cromford Railway.

The Derbyshire coal conveyed over the LONDON AND NORTH-WESTERN system for the CROMFORD and HIGH PEAK Railway was distributed between—

	Tons.
Wirksworth and Whaley Bridge	32,343
And Cromford receives	35
Total	32,378

The LONDON and NORTH-WESTERN Railway in 1867 carried from the DERBYSHIRE Collieries 32,378 tons of coal, which were distributed as follows:—

	Tons.
Cromford, Derby	35
Friden, Do.	770
Hindlow, Do.	19,415
Ladmanlow, Do.	1,128
Parsley Hey, Do.	3,367
Longcliffe, Do.	2,416
Whaley Bridge, Cheshire	25
Wirksworth, Derby	5,222

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London and North-Western Railway.

	Tons.
On the Rugby and Stamford branch	328
„ Blisworth and Peterboro' branch	5,317
„ Bletchley and Cambridge	5,103
„ Buckinghamshire	37,405
Between Rugby and London, exclusive of London	48,598
To foreign lines	34,598

Coals conveyed over the London and North-Western from the Shropshire coalfield.

The quantity distributed between—

	Tons.
London and Crewe	3,480
Crewe and Rhymney	5,286
Stafford and Welshpool	25,365
Craven Arms and Llandovery	174
Bloxwich and Oakengates	18
Holywell receives	43
Kington „	325
Total	34,691

Coals conveyed over the London and North-Western for the Great Western from the Shropshire coalfield.

The quantity distributed between—

	Tons.
Baschurch and Bridgnorth	10,453
Horderley and Montgomery	252
Leominster and Kington	123
Paddington receives	22
Total	10,850

Coals conveyed over the London and North-Western from the Shropshire coalfield.
For the Cambrian line.

The quantity distributed between—

	Tons.
Machynlleth and Whitchurch	304
For the North Staffordshire line.	
Bucknall receives	134
Hanley „	6
Total	140

This coal is distributed as far north by the London and North-Western as Holywell, as far south as London, and as far west as Kington.

The Great Northern Railway.

Great Northern Railway.

The coal and coke conveyed over the Great Northern system from the Derbyshire pits amounted in 1866 to 526,072 tons.

This quantity was distributed as follows between—

	Tons.
King's Cross and Arksey	421,411
Peakirk and Saxilby	16,708
Sibsey and Holton le Clay	1,032
Springfield and St. Alban's	2,326
Hertford and Dunstable	21,890
Baldock and Cambridge	11,137
Bedford and Cambridge	2,878
St. Mary's and Ramsey	852
Ryhall and Stamford	2,230
Thurlby and Bourn	5,342
Sedgebrook and Nottingham	14,093
Honington and Hubbert's Bridge	23,870
Twenty and Sutton Bridge	1,640
Horncastle receives	660
Total	526,072

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The coal and coke from the Derbyshire pits conveyed to various stations on the Great Northern Line for further transit by other Railways was 26,733 tons. Great Northern Railway.

	Tons.
To Peterborough, for the Great Eastern	1,059
„ London, for the London, Brighton, and South Coast	543
„ London, for the London, Chatham, and Dover	23,823
„ London, for the North London	52
„ London, for the London and South-western	1,256
Total	26,733

The Great Northern carried in each of the years 1867, 1868, and 1869 as follows from the DERBYSHIRE collieries:—

	1867.	1868.	1869.
	Tons.	Tons.	Tons.
To stations between London and Hatfield inclusive	424,417	399,279	366,803
Welwyn and Peterboro' inclusive	78,896	70,606	73,059
Tullington and Arksey inclusive	100,597	91,037	91,244
Peakirk and Lea inclusive	17,640	22,041	25,771
East Lincolnshire	859	2,150	1,858
Total	620,409	585,113	558,735
Decrease		35,396	26,378

The NOTTINGHAMSHIRE coals were conveyed over the MIDLAND for stations on the LONDON AND NORTH-WESTERN to the following stations:

The quantity delivered between—

	Tons.
Aylesbury and Farthinghoe was	325
Oxford and Cambridge	952
Roade and Rugby	897
London and Bletchley	7,554
Leamington and Uffington	77
Peterborough and Northampton	381
Other places	853
Total	11,039

The NOTTINGHAMSHIRE coals conveyed over the Midland Railway for stations on the GREAT NORTHERN Railway was 57,201 tons.

This quantity was delivered between—

	Tons.
Grantham and Nottingham	3,016
Welwyn and Dunstable	1,837
Hitchin and Foxton	382
London and Peterborough	27,883
Spalding and Sutton Bridge	573
Peterborough and Retford	14,658
Boston and Jericho	4,636
Boston and Lincoln	1,035
Peterborough and Great Grimsby	3,181
Total	57,201

Coals conveyed over the MIDLAND Railway from Nottingham for stations on the GREAT EASTERN system amounted to 21,523 tons.

This quantity was delivered—

	Tons.
Between Yarmouth and London	16,227
„ Lowestoft and Norwich	821
„ Beccles and Tivetshall	131
„ Norwich and Ipswich	258
„ Wymondham and Wells	41
„ Dereham and King's Lynn	77
„ Norwich and Woolwich	1,597

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Great Northern Railway.

	Tons.
Between Elmswell and Huntingdon	286
„ Mark's Tey and Bury and Shelford	425
„ Chapel and Haverhill	121
„ Southend and London	660
Chigwell Lane receives	7
Total	21,523

Of Nottinghamshire coals conveyed over the MIDLAND Railway for stations on the NORTH STAFFORDSHIRE Railway—

	Tons.
Tutbury receives	1,796
Tunstall „	19
Total	1,815

The Nottinghamshire coals conveyed over the MIDLAND Railway for stations on the LONDON, BRIGHTON, AND SOUTH COAST Railway amounted to 2,428 tons.

This quantity was delivered between—

	Tons.
Hastings and Portsmouth	427
Brighton and London	1,849
London and Leatherhead	145
Crawley receives	7
Total	2,428

Of Nottinghamshire coals conveyed over the MIDLAND Railway for stations on the LONDON, CHATHAM, AND DOVER Railway—

The quantity delivered between—

	Tons.
London and Dover is	250
Sevenoaks receives	1,419
Total	1,669

Of Nottinghamshire coals conveyed over the Midland for stations on the NORTH LONDON Line the quantity was 10,400 tons.

The coal is distributed by the Midland as far north as Buxton, as far south as Brighton, as far east as Yarmouth, and as far west as Gloucester.

WARWICKSHIRE.

A coalowner of the district favours the Committee with the following computation of the production of coal, of its character and general distribution:—

Name of Colliery.	Total Coals raised.	How consumed.	
		Household.	Manufacture.
	Tons.	Tons.	Tons.
Glascote, Amington	93,600	31,200	62,400
Baddesley	93,000	46,500	46,500
Wilnecote	48,000	30,500	17,500
Kettlebrooke	26,000	13,000	13,000
Pooley Hall	26,000	5,000	21,000
Messrs. Morris and Shaw	20,000	15,000	5,000
Tame Valley	20,000 Very inferior.	—	20,000
Peel Colley	9,360	—	9,360
Kingsbury Wood	7,800	6,000	1,800
Total	343,760	147,200	196,560

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Great Northern Railway.

It is distributed in about the following proportion:—

	Tons.
London	130,600
Birmingham	90,600
Warwick	32,500
Cheltenham	20,000
Leamington	10,000
Used in district	60,060
Tota	343,760

Warwickshire Coal.

Warwickshire. London and North-western Railway.

Warwickshire Coalfield.—The London and North-western Railway carried in 1867 from Warwickshire Collieries 211,144 tons. The largest quantities of this coal were left at the following stations:—

	Tons.
Abingdon, Berks	121
Ampthill, Bedford	1,931
Atherstone, Warwick	1,274
Aylesbury, Bucks	12,932
Banbury, L. & N.W., Oxford	1,314
Basingstoke, Hants	410
Bedford, Bedford	1,167
Berkhampstead, Herts	2,434
Berkswell, Warwick	1,240
Bicester, Oxford	4,153
Bliswork, Northampton	2,283
Boxmoor, Herts	2,655
Brackley, Northampton	2,388
Brandon, Warwick	2,592
Brighton, Sussex	2,831
Bromley, Middlesex	142
Buckingham, Bucks	1,252
Burton, Stafford	459
Canterbury, Kent	485
Carshalton, Surrey	304
Castle Ashby, Northampton	358
Chatham, Kent	257
Coventry, Warwick	9,363
Crick, Northampton	826
Culham, Oxford	368
Dunstable, Bedford	2,853
Fenny Stratford, Bucks	1,265
Gamlingay, Cambridge	246
Hampton, Warwick	917
Harbury, Warwick	4,727
Harrow, Middlesex	1,091
Heyford, Oxford	1,095
Hinckley, Leicester	1,201
Islip, Oxford	379
Kenilworth, Warwick	6,328
King's Langley, Herts	731
Leamington, Warwick	10,050
Leighton, Bucks	551
London	62,583
Luton, Bedford	975
Mitcham, Surrey	884
Meopham, Kent	335
Monument Lane, Warwick	623
Narboro', Leicester	411
New Cross, Kent	2,394
Northampton, Northampton	4,618
Norwood, Surrey	159
Nuneaton, Warwick	2,225
Oxford	8,645
Oxford Road, Oxford	631
Paddington, Middlesex	267
Pangbourn, Berks	325
Reading, Berks	1,694
Redhill, Surrey	769
Rickmansworth, Herts	2,078
Rugby, Warwick	3,764
St. Alban's, Herts	1,428
Seven Oaks, Kent	2,670
Spring's Branch, Lancashire	585
Tamworth, Warwick	2,603

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London and North-Western Railway.

Tring, Hertford	1,738
Watford, Hertford	3,391
Willinboro', Northampton	1,600
Winslow, Bucks	2,007
Witney, Oxford	1,544
Woburn, Bucks	2,089
Wolverton, Bucks	1,856

The LONDON and NORTH-WESTERN Railway carried in 1868 from the WARWICKSHIRE Coalfield 183,346 tons of coal. The larger quantities of which were distributed as follows:—

	Tons.
Between Crewe and Rugby, including Rugby and Stafford	11,358
,, Stafford and Birmingham, including Stafford stations	793
,, Birmingham and Rugby, excluding both	29,192

Great Northern Railway.

Of coal from the Warwickshire coalfield carried over the MIDLAND Railway for stations on the LONDON AND NORTH-WESTERN Railway the distribution is as follows:

The quantity delivered between—

	Tons.
London and Bletchley is	376
Aylesbury and Farthinghoe	312
Oxford and Cambridge	2,730
Roade and Rugby	33
Leamington and Uffington	1,786
Other places	39
Total	5,276

The coal conveyed over the LONDON AND NORTH-WESTERN Railway from the WARWICKSHIRE coalfield in 1865 was 159,010 tons, and in 1868 was as follows:—

	Tons.
London and Crewe	110,253
Oxford and Banbury and Cambridge	19,044
Leamington and Leicester	7,997
Blisworth and Peterborough	6,240
Rugby and Stafford	15,654
Moreton receives	41
Ockley receives	49
North Rode receives	70
Total	159,348

Coals conveyed ovea the LONDON and NORTH-WESTERN for the GREAT WESTERN Railway from the WARWICKSHIRE coalfield was as follows:—

The quantity distributed between—

	Tons.
Didcot and Birmingham was	19,403
Didcot and London was	3,605
Warwick and Honeybourne was	665
Reading and Marlborough was	442
Maidenhead and Oxford was	1,051
Oxford and Worcester was	2,256
Cradley receives	6
Southwick receives	123
Princes End receives	11
Wilmcote	197
Total	27,759

From the Warwickshire coalfield the London and North-western conveyed 7,639 tons for the London, Brighton, and South Coast Railway.

This quantity was distributed between—

	Tons.
Leatherhead and London	2,281
Hastings and Bosham	476
Guildford and Shoreham	484
Tunbridge Wells and Petworth	298
Caterham and Brighton	4,100
Total	7,639

The Warwickshire coals conveyed over the London and North-western for the London, Chatham, and Dover was 4,167 tons.

This quantity was distributed between—

	Tons.
London and Dover	4,093
Herne Bay receives	74
Total	4,167

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The Warwickshire coals conveyed over the LONDON and NORTH-WESTERN Railway for the Midland Railway from the Warwickshire coalfield was as follows:— Great Northern Railway

	Tons.
Graffham receives	69
Halton „	11
Finedon „	25
Isham „	7
Skipton „	14
Total	126

The coal from the Warwickshire coalfield is distributed by means of the London and North-western system as far north as Shipton and as far south as Brighton.

Of Warwickshire coals conveyed over the MIDLAND Railway for stations on the GREAT WESTERN System the delivery is as follows:

The quantity delivered between—

	Tons.
Hatton and Oxford is	2,132
Honeybourne and Birmingham	2,201
Didcot and Worcester	113
London and Shrivenham	1,365
Thame receives	6
Kington	29
Total	5,846

The coal from the Warwickshire coalfield is distributed by the Midland as far north as Burton, as far south as London, as far west as Kington, and as far east as Thrapstone.

The Warwickshire coal carried over the MIDLAND for stations on the GREAT NORTHERN Railway was delivered between London and Peterborough, and amounted to 3,628 tons.

LEICESTERSHIRE coalfield.—The coal from the Leicestershire coalfield conveyed over the Midland Railway for stations on the LONDON and NORTH-WESTERN Railway is 159,606 tons. Midland Railway

This quantity is delivered between—

	Tons.
London and Bletchley	62,771
Aylesbury and Farthinghoe	7,978
Oxford and Cambridge	31,925
Roade and Rugby	22,909
Leamington and Uffington	11,097
Peterborough and Northampton	562
Other Places	22,374
Total	159,606

The Leicestershire coals conveyed over the Midland for stations on the GREAT NORTHERN system is 21,530 tons.

This quantity is delivered between—

	Tons.
London and Peterborough	13,273
Welwyn and Dunstable	8,229
Tallingham receives	5
Ashwell „	12
Ancaster „	6
Total	21,530

The Leicestershire coals conveyed over the MIDLAND Railway for stations on the GREAT EASTERN system is 11,293 tons.

The quantity delivered between—

	Tons.
Yarmouth and London is	4,937
Lowestoff and Norwich is	21
Norwich and Ipswich is	128
Wymondham and Wells is	191
Hunstanton and Ely is	1,027
Wathington, and Ely, and St. Ives is	539
Norwich and Woolwich is	2,204
Elmswell and Huntingdon is	732
Marks Tey, and Bury, and Shelford is	1,431
Chapel and Haverhill is	62
Tivetshall receives	15
Snaresbrook „	6
Total	11,293

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Midland Railway. The Leicester coal conveyed over the Midland Railway for stations on the GREAT WESTERN system is 69,963 tons.

This quantity is delivered between—

	Tons.
Didcot and Worcester	21,915
Reading and Hungerford	278
Hatton and Oxford	13,218
Basingstoke and Reading	267
Honeybourne and Birmingham	28,714
Maidenhead and Oxford	1,940
London and Shrivenham	3,631
Total	69,963

The Leicestershire coal conveyed over the MIDLAND RAILWAY for stations on the NORTH STAFFORDSHIRE system is 16,191 tons.

The quantity delivered between—

	Tons.
Eggington and Macclesfield is	9,662
Ashbourne and Rocester is	6,465
Uttoxeter and Congleton is	64
Total	16,191

Midland carries for other lines. Leicestershire coal conveyed by the MIDLAND Railway Company to Hitchin for GREAT NORTHERN Stations, 29,449 tons.

The LEICESTERSHIRE coal conveyed over the Midland Railway for stations on the London Brighton, and South Coast amount to 12,769 tons.

The quantity delivered between—

	Tons.
Hastings and Portsmouth is	4,038
Littlehampton and Tunbridge Wells	1,131
Shoreham and Guildford is	139
Brighton and London	6,933
London and Leatherhead	528
Total	12,769

The Leicestershire coals conveyed over the Midland Railway for stations on the LONDON, CHATHAM and DOVER Railway is 306 tons.

The quantity delivered between—

	Tons.
London and Dover is	164
Seven Oaks and Eyensford is	123
Broadstairs receives	19
Total	306

The Leicestershire coals conveyed over the Midland Railway for stations on the NORTH LONDON LINE is 7,234 tons.

The Leicestershire coal is distributed by the Midland system as far north as Bilton; as far south as Brighton; as far East as Yarmouth; and as far west as Bristol.

Great Northern. The GREAT NORTHERN Railway carried in the years 1867, 1868, and 1869 from the Leicestershire coalfield as follows:—

	1867.	1868.	1869.
	Tons.	Tons.	Tons.
To stations between London and Hatfield inclusive	7,204	1,766	1,213
Welwyn and Peterboro' inclusive	11,598	5,307	5,108
Total	18,797	7,073	6,321
Decrease	-	11,724	752

The Great Northern received from the Manchester, Sheffield, and Lincolnshire Railway at Retford for reconsignment in 1867 136,576, and in 1868 142,332 tons.

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CANAL DISTRIBUTION.

Derbyshire.

The Erewash Valley Canal and Railway carried in the years given below the tons named:

See Appendix for a more detailed Table No. 90. Also Table No. 92 for local deliveries.

Years.	Canal.	Railway.	Total.
	Tons.	Tons.	Tons.
1849 - -	386,955	43,820	430,775
1859 - -	208,905	968,026	1,176,931
1869 - -	192,902	1,709,061	1,901,963

To this quantity not less than 78,000 tons a year must be added, as representing the sales of the district.

	Tons.
In 1867 the Erewash canal sale was - -	117,803¾
Nottingham ditto - - -	89,318
Cromford ditto - -	28,009
	235,130¾

See Appendix Tables No. 90, 91, 92, pp. 91, 92.

The canal at Cromford joins the Erewash Valley at Langley Mill. It brings coal from—

Ripley Colliery, Alfreton. Butterly Company.
Swanwick Colliery, Alfreton. C. R. P. Moorewood.
Pentrich Colliery, Ripley. W. C. Haslam.

This coal supplies the mills at Cromford, and to a great extent Matlock Bath. Some coal is, however, sent by railway to Matlock. Wirksworth is principally supplied from—

Shirland Colliery, Alfreton. Shirland Coal Company.
Denby Colliery, Ripley. W. D. Lowe.

STAFFORDSHIRE AND WORCESTERSHIRE COALFIELD.

Staffordshire and Worcester Coalfield.

The South Staffordshire coalfield extends from the Clent Hills on the south to Brereton near Rugeley on the north, a distance of 21 miles, the mean average breadth of the coalfield being between seven and eight miles.

The general section of the coal measures as given by the late Mr. Jukes* was as follows:

Upper measures, maximum thickness - - -	about 800 feet.
1. Brooch Coal - - - - -	„ 4 „
Intermediate measures varying in 25 pit sections from 87 to 218 feet - - - - -	mean 130 „
2. Thick Coal - - - - - -	about 30 „
Intermediate measures varying in 33 pit sections from 7 to 35 feet - - -	the mean being about 20 „
3. Heathen Coal - - - - -	about 4 „
Intermediate measures varying in 33 pit sections from 56 to 144 feet - - -	the mean being about 109 „
4. New Mine Coal - - - - -	about 8 „
Intermediate measures varying in 43 pit sections from 2 feet to 35 feet - - -	the mean being about 16 „
5. Fire Clay Coal - - - - -	about 7 „
Intermediate measures varying in 40 pit sections from 18 to 52 feet - - - -	the mean being 30 „
6. Bottom Coal - - - - -	about 12 „
Lower measures maximum - -	proved thickness 140 „

The collieries in the South Staffordshire district are very numerous, many of them being but small workings. It not unfrequently happens that a pit is opened, and a few tons of coal having been obtained, it is closed within a few months. The changes from year to year are more numerous in this district than in any other. It is therefore of no advantage to give the numbers of the collieries working for more than one year. In 1869 the collieries actually at work were as follows within the limits of Mr. James P. Baker's district:

Rugeley	district - - -	5 collieries.
Wyrley	„ - - -	12 „
Walsall	„ - - -	42 „
Darlaston	„ - - -	9 „
Bilston	„ - - -	33 „
Willenhall	„ - - -	24 „

* "South Staffordshire Coalfield," by J. Beete Jukes, M.A., F.R.S., *Memoirs of the Geological Survey*. See also *The Coalfields of Great Britain*, by Edward Hull, B.A.

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South Staffordshire collieries.

Wolverhampton district	20	collieries.
Sedgeley „	7	„
Tipton „	18	„
Rowley Regis „	26	„
Oldbury „	9	„
West Bromwich „	40	„
Wednesbury „	7	„
Corngreaves „	22	„
Dudley „	32	„
Brierley Hill „	12	„
Stourport (N. W. Worcester)	4	„
Bewdley „	4	„
	326	

North Staffordshire Coalfield.

North Staffordshire Coalfield.

This important coalfield extends from Handford, Lane End, and Longford on the south, to Biddulph on the north, from Oakmoor and Chedleton on the east to Madeley on the west. The succession of coal seams within this area is remarkable. They have been described as follows by Mr. E. Hull, in his explanation of the Horizontal Section of the Geological Survey, Sheet 42.

Coal Measures.—The structure of the coalfield along the line of section may be described as a series of anticlinal and synclinal curves, broken by faults. These faults occur in greatest force towards the western border, and are apparently connected with the disturbances which produced the contortion of the strata. In the section we cross at least twenty workable coal seams, and a total thickness of measures of 4,000 feet, consisting of sandstones, shales, beds of coal and ironstone.

Ironstone.—The principal ironstone measures are worked at Golden Hill in the beds between the "Deep Mine" and "Rowhurst" coal seams. This is the deepest part of the coalfield in the line of section, and is near the centre of the basin.

Coals.—The principal coal seams are Winghay, 4 ft. 6 in.; Rowhurst, 7 ft.; Burnwood, 5 ft. 2 in.; Twist, 4 ft.; Moss, 3 ft. 10 in.; Birchen Wood, 5 ft.; Tenfoot, 10 ft.; Banbury, 8 ft.; and Bullhurst. The lowest coal seams are those of Wetley Moor.

Faults.—The section crosses ten faults, including the boundary fault west of Talk, the down-throw of which is probably upwards of 350 yards on the west. West of Bunker's Hill Colliery (Talk) No. 2, down-throw east 70 yards. Nos. 3 and 4 passing through Talk have a united down-throw of 140 yards east. Towards Clough Hall the ground is very much faulted and broken, and we cross at least two faults (5, 6) of considerable magnitude. At the railway tunnel (No. 7), down-throw west 20 yards. By east side of turnpike road, Golden Hill, No. 8, down-throw west 15 yards. At 150 yards farther east, No. 9, down-throw east 50 yards; and about 300 yards farther we cross No. 10, striking N.E. and S.W., down-throw 30 yards west. Beyond this the measures rise with regularity, with an increasing dip as we approach the millstone grit.

The succession of the coal seams is given by the same geologist in his coalfields of Great Britain as follows: He computes the area of the coalfield as 75 square miles, and the workable thickness of coal as 94 feet.

	Ft.	In.
1. Peacock coal	6	6
Strata	20	0
2. Spencroft	3	9
Strata	121	0
3. Great Row	8	0
Strata	71	0
4. Cannel Row	5	0
Strata	54	0
5. Wood mine	2	0
Strata	29	0
6. Deep mine	2	8
Strata	361	0
7. Winghay coal	4	6
Strata	377	0
8. Ash or Rowhurst	8	0
Strata	121	0
9. Burnwood	5	0
Strata	68	0
10. Golden Twist	3	6
Strata	486	0
11. Mossfield	4	7
Strata	30	0
12. Coal	3	0
Strata	270	0
13. Birches coal	4	6
Strata	300	0
14. Tenfeet coal	6	0
Strata	102	0
15. Bowley Alley	4	6
Strata	81	0
16. Holly Lane	5	10
Strata	84	0
17. Sparrow Batt's coal	4	9
Strata	222	0
18. Flats	3	0
Strata	108	0
19. Frog's Row	4	6
Strata	30	0
20. Cockhead	4	6
Strata	420	0
21. Bullhurst	4	0
Strata	60	0
22. Winpenny	3	0

Lower coal measures with two thin coals of Wetley Moor. Besides the above, there are 15 other seams of no value.

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North Staffordshire collieries.

The number of collieries, which have not varied much for many years, were 105 in 1869; the number in each district being as follows:—

Cheadle	7	Biddulph	10
Longton	21	Newcastle-under-Lyne	24
Hanley	10		
Burslem	18	Total	105
Tunstall	15		

The produce of coal from these coalfields is given in the "Mineral Statistics" as follows:—

——	1864*.	1865.	1866.	1867.	1868.	1869.
South Staffordshire	8,263,351	8,705,239	8,664,966	8,779,509	8,748,950	8,944,395
North „	3,196,500	3,495,750	3,633,614	3,747,814	3,545,830	3,724,712
	11,459,850	12,200,989	12,298,580	12,527,323	12,294,780	12,669,107

Railway Distribution.

The following general statement applies to the movements of coal in the years 1867 and 1868.

The South Staffordshire coal is carried as far east as Canterbury, in the neighbourhood of which place 161 tons are distributed; as far west as Pennybont in Radnorshire, which receives 147 tons; as far north as Liverpool, which receives 7 tons; as far south as Portsmouth, between which place and Hastings, by the Brighton and South Coast, 1,767 tons are distributed; and besides this, in Sussex, 710 tons are distributed in small quantities. In the neighbourhood of London, 9,021 tons are distributed, and 1,097 tons which London itself receives; and between London and Trowbridge, 17,326 tons are left; between Reading and Swindon, 913 tons; between Maidenhead and Worcester, 61,510 tons; and on the branch lines to Aylesbury, Witney, and Chipping Norton, 6,912. Between Oxford and Birmingham, 27,011 tons are left; in the Black Country, 65,342 tons are distributed; between Cheltenham and Droitwich, including the branch to Ashton-under-Hill, 61,237 tons; between Worcester and Shrewsbury, 18,927 tons; between Shrewsbury and Hereford, 7,480 tons; Bishop Waltham receives 3,046, Basingstoke 3,307 tons, Southampton 214 tons, Redhill 1,929, Abbey Foregate 1,181, and the remaining 1,475 tons, which are carried by the Great Western system, are distributed in small quantities at places not situated on the above-named lines. In all, 290,720 tons.

The railway distribution of the Staffordshire coal will be more clearly seen by the following statements.

The total quantity of Staffordshire coal received at the stations of the London and North-western Railway in 1867 was 337,417 tons, and in 1868 455,967 tons.

Of this quantity, received by the railway in 1867, the towns and works within the coal districts of North and South Staffordshire, or immediately on the borders of the coalfield, received in 1867 as follows:—

	Tons.
Birmingham	69,812
Cannock	15,710
Coventry	809
Darlaston	47
Dudley	29,071
Erdington	5,492
Kenilworth	1,138
Leamington	17,957
Lichfield	10,633
Rugby	344
Rugeley	1,941
Total	152,954

* In 1864 the question of the quantity of coal raised in South Staffordshire was very forcibly opened for closer examination than it had hitherto received by the representations of the Inspector Mr. James P. Baker. In that year the return given was accompanied by the following note:—

"It will be necessary to make corrections in former years, the returns being too small. This has arisen from my having taken the 'boat load' as being 20 tons. The best explanation of the difficulty will be given in the following paragraph, from a paper read at a conference of Mine Owners and Agents, by Rupert Kettle, Esq., V.P. of the Dudley and Midland Geological Society.

"'We have in our colliery district three different weights, each called and commonly recognised as a ton. First the statutable ton, that is, the avoirdupoise weight of 2,240 lbs. Next we have the 'long hundred,' or long weight, as we commonly understand it, that is, 120 lbs. to the hundred weight, instead of 112 lbs., giving 2,400 lbs. to the ton; and then, thirdly, we have the 'boat load' of 24 long hundreds, or 2,880 lbs. to the ton; and, lastly, there is a measure acted upon, I am sorry to say, for business purposes, called 'a boat load.'

"I should like very much some one to tell me any rule by which I can ascertain the exact weight, according to the law standard, of the whole or an aliquot part of a 'boat load of coals.' I know a boat load is twenty tons, and the furthest to which I can carry the weight is twenty tons 'lease weight,' that is, 57,600 lbs., or 25 tons 13 cwt. 2 qrs. and 16 lbs. weight, yet I am told that sometimes a 'boat load of coals' will what is called 'weigh out' 30 cwts. to the ton.'

"I have been assured by the managers of the canals carrying coal, that the mean average of all the boats passing on their canals will give 25 tons of 20 cwt.

"A move has been recently made by Frederick Smith, Esq., Steward to the Earl of Dudley, to make the boat weight ton conformable to the ordinary statute weight, and twenty tons to the boat."

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London and North-western Railway.

LONDON AND NORTH-WESTERN RAILWAY.

The coal conveyed over the LONDON and NORTH-WESTERN system.

From the Staffordshire coalfield, in 1865, 272,892 tons; in 1867 it amounted to 426,912 tons.

This quantity was distributed as follows:—

	Tons.
Between Chester and Holyhead	416
„ Birkenhead and Crewe	8,541
„ Crewe and Northwich	1,794
„ Crewe and Acton	9,228
„ Liverpool and Manchester	1,124
„ London and Crewe	80,348
„ Oxford and Banbury and Cambridge	18,586
„ Blisworth and Peterborough	9,361
„ Leamington and Stamford	19,347
„ Leamington and Leicester	3,586
„ Rugby and Stafford and Lichfield	210,920
„ Stafford and Welshpool	10,124
„ Crewe and Rhymney	50,937
„ Craven Arms and Landovery	2,563
Buxton receives	37
Total	426,912

London and North-western for other railways.

The coals conveyed over the London and North-western Railway for distribution by the GREAT WESTERN Railway was 16,361 tons.

This quantity was distributed—

	Tons.
Between Birmingham and Wolverhampton	2,921
„ Horderley and Montgomery	1,679
„ Leominster and Kington	621
Reading receives	16
Worcester „	6
Oxford „	10,719
Market Drayton „	399
Total	16,361

Coals conveyed over the LONDON and NORTH-WESTERN Railway for the MIDLAND Railway from the Staffordshire coalfield amounted to 317 tons.

	Tons.
Of this Graffham receives	5
Redditch	20
Stoke Works	15
Wichnor	265
Melton Mowbray	5
Oakley	7
Total	317

The LONDON and NORTH-WESTERN conveyed to the LANCASHIRE and YORKSHIRE Railway from the Staffordshire coalfield for Oldham 39 tons.

The LONDON and NORTH-WESTERN conveyed for the CAMBRIAN LINE from the Staffordshire coalfield for stations between—

	Tons.
Machynlleth and Whitchurch	5,380
Penmaenpool receives	21
Total	5,401

The quantity of coal conveyed over the LONDON and NORTH-WESTERN for the NORTH STAFFORDSHIRE Railway from the Staffordshire coalfield was 6,435 tons.

The quantity distributed between—

	Tons.
Colwich and Congleton was	4,909
Egginton and Oakamoor	1,526
Total	6,435

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The distribution of coal from the Staffordshire coalfield in 1867 by railways beyond the main trunk line was as follows: London and North-western Railway.

For the LONDON, BRIGHTON, AND SOUTH COAST Railway.

The quantity distributed between—

	Tons.
Hastings and Bosham was	106
Leatherhead and London	754
Caterham and Brighton	138
Horsham receives	7
East Grinstead receives	14
Tunbridge Wells receives	7
Total	1,026

The LONDON, CHATHAM, AND DOVER RAILWAY received from the Staffordshire coalfield for

stations between London and Dover	1,129 tons.
Between Ramsgate and Faversham	50 „
Total	1,179

The LONDON AND NORTH-WESTERN delivered for the SOUTH-EASTERN RAILWAY,

From the Staffordshire coalfield for Dorking - - - 0 tons.

By aid of the London and North-western system the Staffordshire coal is distributed as far north as Oldham, as far South as Brighton, as far east as Broadstairs, and as far west as Penmaenpool.

The LONDON AND NORTH-WESTERN, in 1868, carried from Staffordshire as follows:—

	Tons.
For London and North-western stations between Preston and Carlisle	12
East of Manchester, including Manchester	310
Warrington and Crewe	557
Between Crewe and Holyhead	111
„ Crewe and Shrewsbury	7,301
„ Shrewsbury and Hereford, including Central Wales branch	19,966
„ Stafford and Welshpool, exclusive of Stafford	6,006
„ Crewe and Rugby, including Rugby and Stafford	30,467
„ Stafford and Birmingham, including South Staffordshire stations	276,527
„ Birmingham and Rugby, excluding both	14,829
On the Rugby and Stamford branch	679
„ Blisworth and Peterborough	12,962
„ Bletchley and Cambridge	9,813
„ Buckinghamshire	19,742
Between Rugby and London, exclusive of London	25,420
LONDON	19,510

Carried for other lines. London and North-western for other railways.

For the CAMBRIAN	5,140
„ the GREAT NORTHERN	1,040
„ the GREAT WESTERN	1,136
„ HEREFORD, HAY, AND BRECON	49
„ LANCASHIRE AND YORKSHIRE	22
„ LONDON, BRIGHTON, AND SOUTH COAST	2,302
„ LONDON, CHATHAM, AND DOVER	833
„ LONDON AND SOUTH-WESTERN	871
„ the MIDLAND	89
„ NORTH STAFFORDSHIRE	273

THE GREAT WESTERN RAILWAY, in 1866, carried from the South Staffordshire district 271,319 tons. The Great Western Railway.

Of this the following quantities were delivered within the district, or at places adjoining to and directly dependent upon this coalfield:—

	Tons.
Bewdley, Worcester	1,055
Bilston, Stafford	2,406
Birmingham, Warwick	19,948
Brettel Lane, Stafford	6,694
Cradley	500
Droitwich, Worcester	60,157
Dudley, Worcester	13,506
Kidderminster, Worcester	6,267

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The Great Western Railway.

	Tons.
Pershore, Worcester	2,573
Leamington, Warwick	1,552
Round Oak	16,024
Shiffnall, Shropshire	3,414
Stoke Works, Worcester	30,177
Stourbridge, do.	18,748
Stourport, do.	382
Stratford-on-Avon, Warwick	3,447
Tipton Basin, Stafford	63
Warwick, Warwick	713
Wednesbury, Stafford	20
West Bromwich, do.	1,325
Wolverhampton, do.	173
Worcester, Worcester	33,415

Great Western Railway, 1866.

Beyond the immediate neighbourhood of the coalfield, the largest quantities of coal were left at the following stations by the Great Western Railway :—

	Tons.
Abbey Foregate, Shropshire	1,181
Aldermaston, Berks	3,435
Banbury, Oxford	2,143
Basingstoke, Hants	3,307
Berrington, Shropshire	832
Blockley, Worcester	1,761
Bourton-on-the-Water, Gloucester	3,174
Bransford Road, Worcester	1,354
Bridgnorth, Shropshire	4,929
Campden, Gloucester	1,862
Charlbury, Oxford	2,000
Cheltenham, Gloucester	294
Chipping Norton, Oxford	4,839
Churchill, Worcester	1,911
Colwall, Hereford	991
Craven Arms, Shropshire	919
Cropredy, Oxford	639
Didcot, Berks	146
Evesham, Worcester	5,320
Fearnall Heath, Worcester	662
Gloucester, Gloucester	163
Handborough, Oxford	2,346
Hartlebury, Worcester	2,353
Henwick, Worcester	4,270
Honeybourne, Worcester	1,614
Ledbury, Hereford	2,272
Leominster, Hereford	3,417
London, Middlesex	1,097
Malvern Link, Worcester	5,863
Moreton-in-Marsh	3,097
Much Wenlock, Shropshire	3,704
Netherton, Worcester	1,075
Oxford, Oxford	1,798
Presthope, Shropshire	2,455
Shipton, Oxford	2,378
Slough, Bucks	1,072
Southam Road, Warwick	1,799
Tenbury, Shropshire	1,659
Twyford, Berks	363
Witney, Oxford	1,993
Woburn Green, Bucks	1,683

The Great Western Railway forwarded in 1866 to stations beyond their line 19,401 tons. The largest quantities being as follows:—

	Tons.
Brighton, Sussex	803
Bishops Waltham, Hants	3,046
Camden, Middlesex	815
Croydon, Surrey	1,247
Carshalton, Surrey	334
Caterham Junction, Surrey	580
Crystal Palace	325
Eastbourne, Sussex	526
Epsom, Surrey	368

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	Tons.
Gipsey Hill, Surrey	239
Horsham, Sussex	436
Hampton Lodge, Shropshire	244
Mitcham, Surrey	899
Newcross, Surrey	947
Norwood Junction, Surrey	369
Red Hill, Surrey	1,929
Streatham Common, Surrey	388
Seven Oaks, Kent	287
Wallingborough, Northampton	425
Waddon, Surrey	460

Small quantities of the South Staffordshire coal, from six tons, upwards, were delivered along the South Coast, as far east as Beckesbourne, Shepherd's Well, as far west as Gloucester and Chippenham, and as far north as Liverpool.

North Staffordshire Railway.

NORTH STAFFORDSHIRE Railway.—The distribution of coal by this Railway was as follows:—

———	1867.	1868.	1869.
	Tons.	Tons.	Tons.
Coal conveyed between North Staffordshire local stations	371,607	391,306	432,095
Coal exported to all places off North Staffordshire Line	205,576	195,087	114,035
Total	577,183	586,393	546,130

STATEMENT of the Number of Tons of Coal, &c. Traffic from North Staffordshire Stations to Midland and Great Northern Stations and Stations South of London, exclusive in both cases of all Traffic on which City Dues are chargeable, for the Year 1867.

	Tons.
To Midland and Great Northern stations	845
,, London and North-western, &c. stations	156,568
	157,413

Cambrian Railway.

THE CAMBRIAN RAILWAY, in 1868, carried from NORTH STAFFORDSHIRE 2,416 tons, the largest quantities having been left at the following stations:—

	Tons.
Ellesmere, Shropshire	99
Llanfyllin, Montgomery	60
Welshpool, do.	25
Newtown, do.	44
Cammes Road, do.	356
Machynlleth, do.	612
Aberystwith, Cardigan	695
Towyn, Merionethshire	79

THE CAMBRIAN RAILWAY carried in the same year from SOUTH STAFFORDSHIRE 4,080 tons, the largest quantities having been left at the following stations:—

	Tons.
Forden, Montgomery	172
Montgomery, Montgomery	1,174
Abermule, do.	251
Kerry, do.	455
Newtown, do.	1,860
Llanidloes, do.	551
Caersws, do.	161
Llanbrynmair, do.	89

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The Midland Railway.

The coal conveyed over the Midland system from the Staffordshire coalfield in 1866 was 33,370 tons, which was delivered as follows:—

The quantity distributed—

	Tons.
Between Derby and Hampton	1,788
„ Water Orton and Blackwell	10,875
„ Bromsgrove and Worcester	1 961
„ Droitwich and Ashchurch	960
„ Beckfordry and Alcester	949
„ Cleeve and Bristol	9,127
„ Nottingham and Lincoln	47
„ Desford and Wooden Box	45
High Peak receives	37
Tewkesbury „	563
Newstead „	25
Shustoke „	4
Shefford „	13
St. Pancras „	6,976
Total	33,370

This coal is carried by this line as far south as London, north as the High Peak, and as far west as Bristol.

The Great Northern Railway conveyed to London from the North Staffordshire collieries 8,904 tons.

The Midland Railway in 1856 carried from Staffordshire collieries:—

	Tons.
Wilnecote	8,486
Glascote, Warwick	13,433
Birmingham	5,002
King's Wood	9,262
Worcester	3,593

CANAL DISTRIBUTION.

The following returns have been obligingly furnished from the canal companies named:—

The Number of Tons of Coal that has passed along the Staffordshire and Worcestershire Canal for the following Years.

Year.	No. of Tons.
1837	134,794
1845	201,920
1850	195,693
1855	186,931
1860	232,249
1865	182,193
1869	226,123

The Severn Navigation Commissioners decline giving any returns, we are therefore unable to trace the coal passing over that river.

Coal forwarded by canal from the various Collieries situated on the Trent and Mersey Navigation during the year ending 31st December—

	1866.	1867.	1868.
	Tons.	Tons.	Tons.
For Local use	190,565		
Through	48,526	359,969	368,935
Total	239,091		

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	1832.	1840.	1860.	1866.	1867.	1868.	1869.
	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
Coal for supply of Birmingham - - -	324,563 18	443,271 12	640,201 5	673,407 15	743,704 0	760,615 10	773,578 0
Ditto for supply of works in Mining Districts - -	718,552 9	1,048,926 10	2,613,598 0	2,700,090 13	2,829,379 10	2,744,452 0	3,230,154 5
Ditto passed to other canals - - -	527,762 15	398,613 11	261,566 7	228,123 0	267,979 6	281,302 0	298,375 13
Total - - - -	1,570,879 2	1,890,811 13	3,515,365 12	3,601,621 8	3,841,062 16	3,786,369 0	4,302,102 18

WEIGHT of COAL passed upon STAFFORDSHIRE AND WORCESTERSHIRE CANAL.

	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
From Stourbridge Canal Brockmoor and Brierley Hill District - - -	62,940	65,808	65,082	64,667
From Ashwood Basin and Hinksford, principally Earl of Dudley's, Kingswinford District - - - - -	77,574	83,589	85,623½	83,001
From Birmingham Canal at Autherley, Bilston and Tipton District - -	7,990	10,369	8,612	5,198
From Birmingham Canal at Churchbridge, Hednesford, and Wyrley - -	10,961	15,211	25,059	38,350
From Trent and Mersey Canal, Brereton, and Rugeley - - -	36,408	34,707	28,724	34,907
From Severn and Stourport, Shropshire District - - - -	1,156	659	111	—
Total - - -	197,029	209,834	213,211½	226,123

	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
Through to Stourport, River Severn, and Bewdley -	7,385	7,402	4,888	3,246
To town of Kidderminster - - -	9,124	15,146	15,954	14,973
Consumed on canal and neighbourhood - -	7,385	42,760	44,204	46,448
Through to Stourport, River Severn, and Bewdley -	10,243	6,146	—	3,618
To town of Kidderminster - - - -	21,360	20,135	25,297	26,682
To Stourbridge and adjoining works - - -	12,551	20,084	20,920	15,656
Consumed on canal and neighbourhood - -	33,414	37,224	35,796½	37,045
Through to Stourport, River Severn, and Bewdley -	1,873	2,415	—	561
Town of Kidderminster - - - -	99	341	—	—
To Shropshire Union Canal, to Brewood, Wheaton-Aston, and Gnosall - - - - -	4,148	4.902	—	2,941
Stourbridge Canal, &c. - - - - -	—	33	—	—
Consumed on canal and neighbourhood - -	1,870	2,678	—	1,696
Through to Stourport, River Severn, &c. - -	3,984	5,593	2,213	20,730
Town of Kidderminster - - - -	840	1,788	45	4,767
Stourbridge Canal and Works adjoining - -	187	98	—	50
Shropshire Union Canal to Brewood and Wheaton-Aston and Gnosall - - - -	1,526	2,800	3,487	4,722
To Autherley for Wolverhampton - - -	186	208	—	66
Consumed on canal and neighbourhood - -	4,318	4,724	2,867	8,015
Through to Stourport, River Severn, &c. - -	10,785	12,022	8,590	9,098
To town of Kidderminster - - - -	372	321	—	1,105
To Stourbridge Canal and adjoining works - -	2,310	1,727	2,373	2,033
To Autherley to Wolverhampton - - -	2,530	566	610	1,077
To Shropshire Union Canal to Brewood, &c. - -	3,134	3,134	2,603	3,293
To Birmingham Canal at Churchbridge for Walsall -	4,156	16,937	14,123	3,947
Neighbourhood of canal - - - -	—	695	111	14,354
Pratt's Wharf - - - - - -	—	—	—	—
Total - - -	197,029	209,843	213,211½	226,123

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An Account of Coals passing along the Coventry Canal.

		Tons.	
1843. From the Cannock or Staffordshire coalfields	To Birmingham, &c.	9,677	
	To Coventry, &c.	1,870	
	Into the Oxford Canal for East and South Warwickshire, Oxfordshire, Northamptonshire, Bucks, and London district	22,370	
			33,917
From the Warwickshire coalfields	To Birmingham, &c.	7,000	
	To Coventry, &c.	29,820	
	To Oxford Canal, as above	58,280	
			95,100
From the Leicestershire coalfields	To Coventry, &c.	3,000	
	To Oxford Canal, as above	61,250	
			64,250
	Total tons		193,267
1849. From the Cannock or Staffordshire coalfields	To Birmingham, &c.	4,900	
	To Coventry, &c.	1,950	
	To Oxford Canal, as above	4,620	
			11,470
From the Warwickshire coalfields	To Birmingham, &c.	17,000	
	To Coventry, &c.	29,730	
	To Oxford Canal, as above	40,900	
			87,630
From the Leicestershire coalfields	To Coventry, &c.	5,390	
	To Oxford Canal, as before	75,760	
			81,150
	Total tons		180,250
1859. From the Cannock or Staffordshire coalfields	To Birmingham, &c.	3,040	
	To Coventry, &c.	100	
	To Oxford Canal, as before	1,900	
			5,040
From the Warwickshire coalfields	To Birmingham, &c.	45,000	
	To Coventry, &c.	55,450	
	To Oxford Canal, as before	25,840	
			126,290
From the Leicestershire coalfields	To Coventry, &c.	5,050	
		7,600	
	To Oxford Canal, as before	96,600	
		12,820	17,870
			104,200
	Total tons		253,400
1869. From the Cannock or Staffordshire coalfields	To Birmingham, &c.	3,190	
	To Coventry, &c.	1,450	
	To Oxford Canal, as before	1,940	
			6,580
From the Warwickshire coalfields	To Birmingham, &c.	49,250	
	To Coventry, &c.	31,100	
	To Oxford Canal, as before	54,950	
			135,300
From the Leicestershire coalfields	To Coventry, &c.	7,600	
	To Oxford Canal, as before	96,600	
			104,200
	Total tons		246,080

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SHROPSHIRE, &c. COALFIELDS.

The Forest of Wyre.

The FOREST OF WYRE coalfield occupies portions of the counties of SHROPSHIRE, STAFFORDSHIRE, and WORCESTERSHIRE. The northern boundary of this coalfield near Bridgenorth is but a narrow strip, the greatest thickness of coal being probably between Upper Arley and Kinlet. The following description is from the pen of a man well acquainted with the district:—

"The collieries or places now in operation are at Harpsford, Billingsley, Harcott, Shatterford, Arley Wood, Bayton, Mambles, Hunts Bottom, Pool House, Abberley, Pensax, Old Hall, and Blakemoor. At Harcott they are getting the sweet coals, the larger of which are sold at 12*s.* per ton at the pit, short weight. At Billingsley only are they getting the Brock Hall coal, as I have designated it, to prevent confusion with other sulphurous coals met with in the district. The shaft at Billingsley, out of which this is worked, was quite recently sunk by Messrs. Breakwell and Buchley; all the others are working what may be called the main sulphur coal. The average selling price of the large coal is from 9*s.* to 10*s.* at the pit's mouth. They are all worked very irregularly, the most constantly employed being those at Blakemoor and Abberley. The annual output of the whole coalfield may be estimated at about 15,000 tons a year, a most insignificant amount; this is not, however, because the district is incapable of doing more. One great barrier is the very high royalty demanded; but the principal reason is that the railways have introduced the sweet coals of other districts at a moderate price. The town of Cleobury Mortimer is almost entirely supplied by these sulphurous seams, and the time may yet come when such fuel will not be despised as it now is. Broseley herself, once the centre of the coal and iron trade of this country, is now dependent on the very same sulphur coal for its supplies."*

The section of the coal strata of the Forest of Wyre is given by Mr. Talbot Avelines, of the Geological Survey:—

	Ft.	ins.
1. Sandstone and shale	76	0
2. COAL	1	10
3. Sandstone and shale	24	0
4. COAL	2	0
5. Sandstone and shale	39	0
6. COAL	4	0
7. Sandstone and shale		

The CLEE HILLS Coalfield, SHROPSHIRE, and part of HEREFORDSHIRE.

The Clee Hills coalfield.

This very unimportant coalfield extends from Clee Hill Common on the north, the limestone a little north of Hope Baggot on the south, and from the ancient encampment near Titterstone on the west to the fault a little to the west of Hopton Waters on the east. The thickness of the coal formation is but small, containing only two or three thin coal seams.

The SHREWSBURY coalfield. This forms a narrow band, extending from the base of Haughmond Hill, near Uffington, on the north, to Pontesbury and Habberley on the south, when it again turns towards the north-west, and passing by Westbury and Woolaston, to the river Severn between Alberbury and Melverley. The total length of this coalfield is about 18 miles long. Near Pontesbury it has a thickness of about three miles, but it seldom exceeds a mile in width in any other part. "In "its lower part it contains two or three coal seams, which have been worked to a small extent, but "are not of sufficient value to induce mining operations far from the outcrop."†

SHREWSBURY coalfield is thus described in the Silurian system:—‡

"Where most developed this formation contains three seams of coal, which, in descending order, consists of *half-yard*, *yard*, and *two-foot* coals. The quantity, thickness, and even the number of these beds vary in different places, but it may be stated as a general rule that the lowest or two-foot coal is the best, the middle and upper seams being for the most part pyritous and of inferior quality, particularly the yard coal, usually termed "strikers." These coal beds are separated from each other by red, green, and black shale, and clod, some portions of which have a saponaceous feel, as if charged with magnesia, and thus they bear some resemblance to the variegated shale or marl of the overlying new red system. Owing to the unequal thicknesses of the overlying strata, and also to numerous dislocations, the coal seams are necessarily reached at various levels, the depths of the shafts increasing with the distance from the natural outcrop of the coal. The deepest pits, or those farthest from the edge of the field, are about 95 yards, whilst the shallowest, or those nearest to the hilly sides of the older rocks, are not more than ten or twenty. Wherever the measures have been examined between Pontesbury and Westbury the three beds of coal have been found; but to the westward of the latter place one of them appears to thin out. There is, however, a considerable space along which no trials have been made; and the old works at Woolaston have been so long abandoned, that no correct information is to be obtained respecting them. At Braggington and Coedway, the western termination of the field, there are only two beds of coal worth working, the lowest of these, or the thin coal, being from about 15 to 18 inches thick. The works at both these places are abandoned, those at Coedway having been wrought during a period of twenty years. At Braggington a good

* Mining Journal, December 31st, 1870.
† "The Coalfields of Great Britain," Edward Hull, F.R.S.
‡ The Silurian system, &c., by Roderick Impey Murchison, &c., 1839.

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deal of capital was recently expended, but the thinness of the beds, their dislocations, and high inclination, (close to the edge of the trappean rocks of the Breidden Hills,) and their distance from any good market, led to their abandonment. It appears, however, that the works were conducted in an unscientific manner, for there can be no doubt that these beds of coal, though thin, might, if well managed, prove of considerable use in this district in burning the contiguous limestone of the dolomitic conglomerate. The present success of the pits at Westbury is indeed a proof of how much may be done by spirit and assiduity."

Coalbrook Dale coalfield.

THE COALBROOK DALE COALFIELD extends from the Severn, near Broseley and Ironbridge on the south, having an irregular western boundary at Coalbrook Dale, Little Wenlock, and the faults a mile or two to the eastward of Wallington, where it has its greatest thickness of about four or five miles. It then, becoming gradually narrower, extends to Lilleshall and Church Aston.

The following extract from the "Silurian System" gives a clear view of the condition of this coalfield :—*

"A section of the Hill Lane pits, near Madeley, may be given as an instructive example of the succession in one spot where the strata are pretty fully developed. In a shaft 230 yards in depth we are presented with 21 carbonaceous beds, of which the 11 uppermost are sulphureous and impure. Upper coals, similar to those at Caughley and Tasley, alternate with clays, marls, sandstones, both argillaceous and calcareous, and with calcareous breccia or conglomerate. Some of these beds may represent the upper coal measures of Manchester. The lower coals, or those extracted for use, which in this shaft are reached at a depth of about 198 yards, are named in descending order :—

	Ft.	in.
1. Viger coal	1	8
2. Two-foot coal	1	8
3. Little Ganey	0	7
4. Lower Ganey	1	6
5. Best coal	2	5
6. Randle coal	2	8
7. Clod coal	1	4
8. Little Flint coal	2	6
9. Coal under Crawstone	1	0
10. Lancashire Ladies' coal	0	9
Total of good coal in this shaft	15	11

"In the above list the beds which separate the seams of coal are omitted.

"The following table will explain to the reader how little the beds of coal are persistent, and how much they vary in their dimensions in different parts of the field, the united thickness of the mass of coal in any one shaft never being dependent upon the number of the seams :—

Pits.	Thickness of Coal. Yds.	ft.	ins.	No. of Beds of Coal.
Hadley	15	0	0	16
Sneds Hill	14	2	2	12
Malinslee	11	0	10	13
Langley	11	2	6	11
Dawley	14	0	0	16
Lightmoor	13	2	0	17
Madeley	10	2	10	24
Broseley	7	0	9	13

The quantities of coal produced from the collieries of this irregular coalfield for ten years has been as follows :—

In 1860 there appears to have been 68 collieries at work. Some of these have been placed in their more correct position, in the Staffordshire field, in 1869. The return of Mr. Wynne, the inspector of the district, gives 59 collieries.

See Appendix No. 27, p. 40.

1860.	1861.	1862	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
850,500	829,750	1,029,750	1,150,000	1,150,750	1,135,000	1,220,700	1,558,500	1,496,500	1,393,862

* "The Silurian System, &c.," by Roderick Impey Murchison, Bart., K.C.B., &c., 1839. See also "Siluria," by the same author, 1867.

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THE LONDON AND NORTH-WESTERN RAILWAY carried from SHROPSHIRE in 1865 32,254 tons of coal. London and North-western Railway.

The quantity conveyed in 1867 was 45,936 tons. The following list will convey an idea of the principal points of distribution :—

	Tons.
Barrington, Shropshire	106
Bishop's Castle, do.	20
Bromfield, do.	196
Broome, do.	142
Bucknell, do.	134
Church Stretton, do.	36
Coalport, do	5,933
Craven Arms, do.	556
Crick, Northampton	180
Glynde, Sussex	983
Hadnall, Shropshire	241
Houghton	1,238
Kingsland, G. W., Hereford	113
Knighton, Radnor	325
Leominster, Hereford	1,368
LONDON	1,180
Ludlow, Shropshire	162
Madeley Market, Shropshire	454
March Brook	232
Middletown, Montgomery	247
Minsterley, Shropshire	2,729
Newport, do.	3,296
Newtown, Montgomery	261
Onibury, Shropshire	225
Pensarn, Merioneth	97
Prees, Shropshire	319
Shrewsbury, Shropshire	10,064
Stafford, Stafford	1,652
Stinchley, Shropshire	4,464
Trench, do.	2,773
Wallington, do.	2,512
Wem, do.	1,451
Westbury, do.	960
Yockleton, do.	285

The London and North-western Railway carried from the Shropshire coalfield in 1868 59,186 tons. This was distributed as follows :—

	Tons.
Between Crewe and Holyhead	32
„ Crewe and Shrewsbury, including Shrewsbury	19,147
„ Shrewsbury and Hereford, Wales branch	4,291
„ Stafford and Welshpool	32,297
„ Crewe and Rugby	2,187
„ Buckinghamshire	345
	58,299
The Cambrian received from the London and North-western	830
The Great Western „ „ „	57
Total	59,186

THE CAMBRIAN RAILWAY carried, in 1868, from NORTH SHROPSHIRE 1,192 tons of coal, the largest quantities having been left at the following stations :— The Cambrian Railway.

	Tons
Oswestry, Shropshire	22
Montgomery, Montgomery	101
Kerry, do.	95
Newtown, do.	293
Llanidloes, do.	64
Cammes Road, do.	99
Machynlleth, do.	57
Bow Street, Cardigan	90
Aberystwith, do.	67
Harlech, Merionethshire	46
Port Medoc, do.	59

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THE MID WALES RAILWAY received from other lines, during the year ending 31st December 1867, 30,659 tons. (No information has been obtained by which we are enabled to state from which of the coalfields this may be derived. Probably a considerable share of it is from the Shropshire coalfield.)

CANAL DISTRIBUTION.

The SHREWSBURY CANAL belongs to the LONDON AND NORTH-WESTERN RAILWAY. Two dealers at Shrewsbury received all the coal carried on this canal. It is entirely devoted to supply the local traffic.

The Shropshire Union Railways and Canal Company carried from the Shropshire district from Donnington Wood to (?) Shrewsbury, 33,158 tons 10 cwt.

GLOUCESTERSHIRE AND SOMERSETSHIRE COALFIELDS.

FOREST OF DEAN COALFIELD.—The area of this coalfield is about 34 square miles. The thickness of the upper shales and sandstones of Dean Forest is about 1,255 feet, making, with 1,055 feet of the central sandstones and 455 feet of a sandstone series referable to the Farewell rock, a total depth of 2,765 feet for the coal measures of the Forest of Dean. The following is a list of the coal seams and their respective thickness:—*

	Ft.	in.
1. Coal	0	3
2. Do.	0	6
3. Do.	0	6
4. Do.	0	8
5. Do.	0	8
6. Do.	1	0
7. Do. Crow delf	0	8
8. Do. and shale	1	2
9. Do. Dog delf	1	2
10. Do. Smith coal	2	6
11. Do. Little delf	1	8
12. Park End High delf	3	7
13. Do.	0	6
14. Do. and shale, Starkey delf	2	6
15. Do. Little coal	1	1
16. Do.	0	6
17. Coal, Rocky delf	1	9
18. Do. and shale	0	8
19. Do.	0	6
20.–22. Do. and shale, Upper Churchway delf	4	2
23.–24. Do. do. Lower Churchway delf	2	0
25. Do. Shafnel delf	0	6
26. Do. Braizley delf	1	9
27. Do. Nag's Head or Weaver's	2	9
28. Do. Whittington delf	2	6
29. Do. Coleford High delf	5	0
30. Do. Upper Trenchard	2	0
31. Do. Lower do.	1	4

There are but nine of these coal seams which have a thickness of two feet and upwards. Within this district about 50 collieries are worked annually.

FOREST OF DEAN.

COAL worked, and how disposed of, in 1867 and 1868.

Workings.	1867.	1868.	1869.
	Tons.	Tons.	Tons.
Galees' returns of quantities worked, exclusive of colliery consumption and that consumed by workmen, viz.	777,677	778,828	—
Estimated quantity consumed by engines	40,000	40,000	—
By workmen	30,000	30,000	—
Total estimated raisings	847,677	848,128	852,125

Disposal.

	1867.	1868.	1869.
	Tons.	Tons.	
By Great Western Railway from Lydney	7,760	7,617	
From Bwllo Pill Railway	300,000	306,000	
Water from Lydney	166,992	168,404	
Ditto from Bullopill (estimated)	59,380	61,220	No
Land sales in the forest and surrounding district	82,000	80,000	
Consumed by engines and workmen	70,000	70,000	return.
Consumed at iron works, tin works, and wire works in the forest (estimated)	161,545	154,887	
Total	847,677	848,128	

* "Memoirs of the Geological Survey of Great Britain; on the formation of the rocks of South Wales and South-western England." By Sir Henry de la Beche, C.B. See also, "Observations on the South-western Coal Districts of England. Geological Transactions." Second Series, vol. i.

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THE BRISTOL COALFIELD.—The extreme length of this coalfield from its northern apex at Cromhall to the northern flanks of the Mendips is about 25 miles. Across Frampton Cotterell it has a width of about 4½ miles, from Stapleton to Mangotsfield about 5 miles, and a line drawn from Bristol eastward to Naishcombe Hill about 6 miles.

The general section of the Bristol coalfield, by Mr. David Williams, gives 51 beds of coal. These are grouped by Mr. E. Hull in the following manner:—

Succession of strata near Bristol.

Lias, lower, middle, and upper.		
Trias	Red marl.	
	Dolomitic conglomerate.	
Coal measures	Upper series, with 10 coal seams	1,800 feet.
	Central or Pennant grit, 5 coal seams	1,725 „
	Lower shales, 36 coal seams	1,600 „
Millstone grit		95 „
Carboniferous limestone		2,338 „

Of these coal measures 20 only are two feet and upwards in thickness, producing 71 feet of coal. Fourteen collieries are worked within this district, and the produce of coal for several years has averaged about 458,000 tons.

SOMERSETSHIRE.—The coalfield of North Somersetshire may be for practical purposes conveniently divided as follows:—

	Collieries.
1. The NETTLEBRIDGE district, which extends eastward to Mells, in which there are now at work	6
2. The RADSTOCK district, in which there are at work	9
3. The PAULTON district, which extends to a little to the N.E. of Farmborough, contains	12
4. TWIVERTON, near Bath	1
5. BEDMINSTER coalfield, extending to the city of Bristol, in which district there are	5
6. NAILSEA coalfield, in which there is at present working only	1
The total number of collieries at work in 1869 being	34

The first pit sunk in this district was the "Old Pit." This was sunk about 110 years since. After the coal had been discovered by this sinking, others were made with success. The operations were then exceedingly rude, and the appliances for bringing the coal to the surface were of the simplest description. It is stated, however, that shortly after this not less than from 300 to 500 bushels of coal were hauled from the pits in a working day, the average produce being 20 tons a day, or 8,000 tons a year. The authority on which this is given is rather traditional than such as may be considered reliable.

We are informed by Messrs. G. C. Greenwell and J. McMurtrie that at the commencement of the present century there were—*

Near Nettlebridge, 7 collieries or 8 pits.
„ Paulton 10 „ 14 „
„ Radstock 7 „ 7 „

making in all 29 pits from which coal was being drawn. After careful inquiries these authorities assume that 20 tons of coal were raised from each pit in each working day, which would give if the collieries were in constant work, 185,540 tons a year. Since, however, many of the collieries would be idle in the summer, and all of them working leisurely, it is estimated that not more than 140,000 tons of coal were raised from this portion of the North Somersetshire about 1800.

In 1864, Messrs. G. C. Greenwell and J. McMurtrie gave a list of the Radstock collieries at work at that time.* They were—

In the vicinity of Nettlebridge, 4 collieries with 4 pits.
„ „ Radstock, 10 „ 13 „
„ „ Paulton, 12 „ 12 „

As the agents of the Countess Waldegrave, these gentlemen were in the best possible position for obtaining accurate information, and they report the quantity of coal raised to have been as follows:—

From the Nettlebridge district	290 tons a day.
„ Radstock district	1,160 „
„ Paulton district	650 „
Total	2,100 „

* See pamphlet "On the Radstock portion of the Somersetshire Coalfield." By G. C. Greenwell and J. McMurtrie.

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Radstock collieries.

But after making allowance for the work lost during the summer months, the annual quantity of coal produced does not exceed 600,000 tons.

At present (1869) there are in activity—*

In the vicinity of Nettlebridge, 6 collieries with 6 pits,
" " Radstock, 9 " 13 "
" " Paulton 12 " 12 "

The quantity of coal produced at these collieries in 1867, according to returns actually furnished, was as follows:—

	Coal. Tons.	Slack. Tons.	
The Nettlebridge district	10,919	8,081	
The Radstock district	219,502	38,940	
The Paulton district	110,846	25,390	
Total	341,267	+ 72,411	= 413,678

It appears that in some cases the whole of the coal raised has not actually been returned. The coal used for engines is not always shown in the books, and in Somersetshire workmen's coal never is. It is therefore necessary to add this to the quantity returned.

	Tons.
Engine coal is estimated from several returns at	72,000
Workmen's coal at	60,000
Total	132,000

Returns have not been obtained from six collieries. These are estimated by those who are well acquainted with the out-put of the Radstock collieries at 115,000 tons. The produce of the Radstock section of the North Somersetshire collieries would therefore stand as follows:—

	Tons.
Collieries from which exact returns have been received	413,678
Collieries estimated	115,000
Engine coal not included	10,000
Workmen's allowance coal	7,000
Total	545,678

	Tons.
About from 1800 to 1810 the average annual produce was estimated at	182,540
In 1864 Messrs. Greenwell and MrMurtrie estimated it at	600,000
In 1867 the returns as above were	545,678
In 1868 " "	586,000
In 1869 " "	539,000?
In 1870 " "	525,000

There has been within the last two years a slight falling off in the production of this district. The return given in 1864 is thought to be somewhat in excess of the truth, but it contains "the small coal left underground, the men being paid upon large coal only," which the returns for the last two years do not include. The year 1864 is stated to have been a busy year in the coal trade of the Radstock district, and three collieries are now returned as producing respectively one third, one half, and three fourths what they did in that year.

Uses.

The coal from the Radstock seams are usually considered as the best for household purposes. This coal burns briskly, making a clear fire; as it gives out a good heat it is chosen for cooking, and it leaves but a small quantity of ash.

Some of the coal from the upper subdivision of the lower series of beds, especially those of the Garden Course, and Little Vein, is not inferior to the Radstock coal.

The Farringdon coal is inferior; it is not suitable for the smith; it is not fit for combustion in the fires of steam boilers. It is, however, used for domestic fires, principally in close stoves. This coal can be raised very cheaply, and it is therefore sold at a price which insures it a ready sale. It is used for burning lime.

"A few seams in the lower part of the basin are used for iron making, but the coal of the district is best adapted for household purposes, and it is to be met with in most of the markets between Exeter and Reading. Originally it had to be conveyed exclusively by carts, and even in those days it found its way extensively into Wilts and Dorset; but rather more than sixty years ago a canal was constructed which branched out of the Kennet and Avon Canal at Dundas, and crossed the country to Midford, where it divided, one branch extending to the vicinity of Paulton and the other to Radstock. The Paulton branch is still employed, but in consequence of litigation the Radstock section was converted into a tramway, over which coal is now conveyed to the barges at Midford for the supply of certain markets in Wilts."†

"Several lines have been projected, but they have only resulted in a single mineral branch from Frome to Radstock, with a private line two and a quarter miles in length leading out of it at Mill,

* See Appendix, p. 42.

† Greenwell and McMurtrie.

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constructed by the Westbury Iron Company for the conveyance of the minerals from their Nubury Colliery."*

"It is from the lower subdivision that the furnaces at Ashton Vale† near Bristol, and at Westbury and Seend in Wiltshire,‡ and the many small iron works, forges, &c. throughout North Somersetshire and the adjoining counties derive their chief supplies of fuel.§

Prices.

Camerton Colliery.	Large, 9*s.* 6*d.*, 7*s.* 76*d.*	Retail, 10*s.* 6*d.*, 9*s.*
	Small, 3*s.*	„ 3*s.* 6*d.*
Timsbury Works.	Large, 9*s.*, 7*s.*	„ 10*s.* 10*d.*
	Small, 3*s.*	„ 3*s.* 4*d.*

Nailsea Coalfield.

Nailsea coalfield.

The workings in this coalfield are now very unimportant, although a good deal of coal has been removed in former years. A great many pits have been sunk, and the coal worked on the *White's seam* on the north (the principal seam in the second or Nailsea series), the upper seam called *Grace's vein* occupying a very small area of the Nailsea basin.

For some years, however, two collieries only, Nailsea Works, White and Company, Nailsea Heath New Works, Bowen and Morgan, have been worked.

	Tons.
In 1863, the Nailsea Works produced - - - -	22,295
1864 „ „ - - - -	33,234
1865 „ „ - - - -	17,574
1866 „ „ - - - -	23,224
1867 „ „ to August 6th, from Lord Bath's land only, when the colliery was worked out and abandoned, probably as much more was obtained - -	6,966

The Nailsea Heath New Works is therefore the only colliery now in activity, and from this colliery in the past year nearly 20,000 tons of coal were raised.

Distribution and Uses.

	Tons.
The glass works consumed - - - -	15,500
Sales in the country around - - -	3,000
Engine coal and pit fires - - - -	1,000
Colliers' allowance - - - - -	250

The Royalty paid at Nailsea Heath pit is 6d. per ton.
The selling prices, large, 12s. 6d. and 10s., small 4s. 6d. per ton.

Devonshire.

Bovey Coal, or Bovey Tracey Lignite.

Bovey Tracey coal.

This deposit is found near the village of Bovey Tracey, about eleven miles south-west of Exeter, spread over a district known as Bovey Heathfield, beneath an accumulation of gravel mixed with clay and sand.

The first published notice of this lignite appears to have been in 1760, when the Rev. Dr. Jeremiah Miller communicated his views, and gave a description of the beds to the Royal Society.‖ Attention having been called to this lignite, the beds have been the subject of frequent examination; but the whole question has never been so thoroughly answered as it has been by Mr. Wm. Pengelly in the memoir already referred to.

According to Lyson, this lignite was first worked for use early in the last century.¶ He does not give his authority for this statement, and the probability is that for use in the cottages around Bovey Tracey small quantities were obtained at even a much earlier date.

In 1772 a pottery was established at Ideo, which pottery was abandoned in 1837.

In 1797 Dr. Maton** described those deposits, apparently from actual observation. He states that the pits were about 80 feet deep, and that the lignite was worked to supply fuel for the pottery.

In 1812 another pottery was established near Bovey Tracey, which is still in active operation. This was formerly called Folley Pottery, from the coal pits. The lignite is locally called Folley coal.

The production of lignite has varied considerably in different years. The following returns have been obtained, and they are the only ones on which reliance can be placed.

	Tons.
In 1853 the quantity raised was - -	18,633
1856 „ „ - - -	3,850
1857 „ „ - -	5,600
1867 „ „ - - -	1,368
1868 „ „ - -	1,383

* Greenwell and McMurtrie.
† Works abandoned.
‡ Ashton Vale also use coal from their own colliery.
§ Seward W. Brice, B.A., "The Coalfield of North Somersetshire."
‖ Mr. Pengelly, in his memoir on "The Lignites and Clays of Bovey Tracey." Transactions of the Royal Society, vol. 153, part 2, p. 100, gives a list of 17 authors who have written on the "Bovey coal."
¶ Magna Britannia, Devonshire, p. cxcii.
** "Observations on the western counties of England."

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Bovey Tracey coal.

Of the quantity produced in the two last years about a quarter has been used by the peasantry.

In 1853 the pottery kilns were fired with lignite. At present (1869) there is not any used in the earthenware kilns; the small quantity which is consumed is used at the brick works. Steadily as coal has become cheaper, owing to increased facilities for transit, the quantity of lignite employed in the works has diminished.

For heating the kilns there are, it is stated, some advantages in the use of lignite. The heat is said by the workmen to be great, and this fuel, according to them, "throws the heat much further than coal does." This can only mean that the fuel burns more rapidly; that the combustion is more intense than that produced by common coal. Indeed we learn that it requires that four times the body of fire should be kept up; that it burns rapidly, and that the labour of supplying the fires and removing the ash is very great.

This fuel is used in small quantities in the cottages of the neighbourhood, but the disagreeable smell which it gives out in burning renders it objectionable. None of the Bovey lignite is sent out of the neighbourhood.

In a company who were engaged in working the deposits of iron ore in the neighbourhood of Ilsington proposed to use this Bovey lignite for smelting the ore. Two blast furnaces were commenced, but ere they were completed the company was dissolved, and the experiment therefore of using this lignite for iron smelting was never tried. Some information on this point will be found in connexion with the accounts given of the attempts to utilize the Irish peat.

Bideford Anthracite.

Anthracite.

The only other description of coal which has been worked in Devonshire is the culm or anthracite of Bideford.

Beds of anthracite, accompanied by black shales and sandstones, and very irregularly interstratified with them, stretched across the country from Greenacliff, through Bideford, and by Alverdiscot, towards Chittlehampton. There are evidences that those culm deposits were worked along their outcrops at some probably very early period. Many old workings have been from time to time discovered; some of the pits having been carried to depths of from 8 to 10 fathoms. Probably the miners, with the primitive appliances of those days, were unable to go any deeper, owing to the accumulation of water in the workings.

No authentic account of the working of this anthracite exists prior to Lyson,* who tells us that in the middle of the eighteenth century the culm beds near Eastacot were extensively worked. A pit here was reopened in 1790, and abandoned in the following year, when the depth to which it had been carried is stated to have been 25 fathoms, and the quantity of anthracite produced equal to nearly 900 bushels a week. As this would be equal to, at least, 1,500 tons a year, there are good reasons for believing this to be an exaggeration.

Sir Henry de la Beche, writing in 1838, says, "Culm or anthracite miners are now at work a mile on the east of Bideford." Quoting a manuscript of Mr. John Rundle, M.P., a proprietor, the same authority informs us that the eastern mine produced about "700 bushels or 58 tons of anthracite per week." There is evidently some error here, arising no doubt from the great uncertainty existing as to the weight of a bushel of coal. The ordinary bushel was estimated at 59 pounds avoirdupoise, but the Cornish heaped bushel of coal was 86 pounds; the latter would only give 26 tons 18 cwt., or about 1,400 tons a year. "From the Western mine about 1,500 tons were raised in one year."† We are indeed left in considerable doubt as to the actual weight of anthracite produced from those beds.

"The middle or great anthracite bed, upon which all the chief workings have been carried on, is described as varying from 6 inches to 14 feet in thickness, the average being about 7 feet. As far as had been seen or heard of this bed, it had everywhere been removed by old workings to the depth of 8 or 10 fathoms."‡

Production.

In 1856.	Return of Anthracite - - - -	5,036 tons.
In 1857.	„ „ - - - -	4,173 tons.

Uses.

This fuel was at one time extensively used at Greenacliff in Barnstable Bay to burn with the limestone brought there from South Wales.

A variety of the anthracite, probably formed from decomposed portions of it, has long been raised near Bideford, and employed as a pigment. Lysons says it was used in Plymouth in 1822; and Mr. Dingle, Mayor of Bideford, 1868, writes, "The black paint is still raised and sold."

Distribution of coal from Gloucestershire and Somersetshire.

Appendix, Table No. 94, p. 94.

The following summary of the tables given in the appendix show that in the shipments from Gloucester, since 1851, increase coastwise has been 71,644 tons, and the foreign shipments 6,025 tons, the total increase being 77,689 tons, or an increase per cent. 90.02 between 1851 and 1860. Since 1861, or in nine years, the increase coastwise has been 2,082 tons. In the same period there has been a decrease in foreign shipments of 4,152 tons. A total decrease is however shown of 2,070 tons.

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* Geological Report on Cornwall, Devonshire, and West Somerset, 1839. † De la Beche. ‡ Ibid., quoting Rindle MS.

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Shipments from Gloucester— Gloucester shipments.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	Increase of Shipments over previous 10 years.
	Tons.	Tons.	Tons.	Tons.
1851 to 1860	1,091,423	18,536	1,109,959	18,752
1861 to 1869	1,497,600	20,510	1,518,110	408,151

for nine years. Or supposing the shipments of 1870 to be about the same as those of 1869, or 163,782 tons, the increase in the 10 years would be 571,933 tons.

The shipments of coal from Bristol during the same period, show that since 1851 there has been a decrease coastwise of 888 tons, but an increase in foreign shipments of 258 tons. There is a total decrease, however, within the 10 years, of 630 tons, or a decrease per cent. 5.46. Since 1861, or within the nine years, there has been an increase coastwise of 32 tons, and a decrease in foreign shipments of 8,020 tons, showing a total decrease 8,896. Decrease per cent. 9.27.

Appendix Table, No. 95, p. 94.

Year.	Coastwise.	Foreign.	Total Shipments.	Increase of Shipments over previous 10 years.	Decrease of Shipments from previous 10 years.
	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	14,002	102,944	116,946	4,400	—
1861 to 1869	4,094	86,480	90,574	—	26,372

Railway Distribution and Canal.

Great Western Railway.

The Great Western Railway:—

For the year 1866 the Great Western Railway Company's officers furnished for the use of the Royal Commission the most detailed statement of their coal traffic, giving the total quantity of coal carried by them; the several quantities left at each of the stations on their line; and those, also, which were forwarded to other stations beyond the Great Western Railway. We are not at liberty to publish all those minute details, for reasons which will be obvious to every one; but they enable us to trace out the distribution of the Radstock coal by railway with great precision.

	Tons.	Tons.
In 1866 the Great Western Railway received for stations on their line -	201,275	
For stations beyond their line - - - - -	10,673	211,948

In 1868 the tonnage of coal forwarded from the Radstock coalfield was 254,134 tons.

By the Great Western system the Radstock coal is sent as far north as Stow-on-the-Wold. 5,739 tons are left at Chippenham, and between Chippenham and Paddington, which receives 12 tons of coal, 13,101 tons are distributed; while between the same town and Bristol 11,938 tons are left. Between Bath and Reading, on the Berks and Hants line, 49,058 tons are left. Between Frome and Wells, and Portland and Bridport, on the Wells, Somerset, and Weymouth line, 58,072 tons are delivered. Between Trowbridge and Salisbury 58,637 tons and 4,118 tons are distributed in small quantities at various unimportant places a few miles from the main line. On the South-western, between Salisbury and Portsmouth, 385 tons are left. Between Salisbury and Feniton (in Devonshire, which is the most westerly point to which this coal is carried,) on the South-western extension, and Salisbury and Yeovil line, 12,386 tons. Between Southampton and Dorchester, 857 tons; and the remaining 8,645 tons, which are sent from this coalfield by the Great Western system, is distributed in various small quantities at towns not situated on either of the above-named lines, the largest quantity, 174 tons, being left at Grately; the total quantity carried by the Great Western system being 222,948 tons.

The Midland Railway in 1856 carried from Gloucestershire collieries:— Midland Railway.

	Tons
From Tewkesbury - - - - -	103
„ Gloucester - - - - -	2,766
„ Yate - - - - -	8,360
„ Shortwood - - - - -	7,157
„ New Engine - - - - -	6,950
„ Coal Pit Heath - - - - -	53,677
„ Cook's Pit - - - - -	52,678
„ Bristol - - - - -	344

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The MIDLAND RAILWAY in 1866 received the following quantities of coal from this field at the stations named :—

	Tons.	
Frocester	164	
Cam	114	
Dursley	2,615	
Berkeley	904	
Charfield	10,583	
Wickwar	3,244	
Yate	2,264	
Stapleton	2,484	
Bristol	208,373	
Total in 1866	230,745	
„ 1867	226,643	4,102 tons
„ 1868		

The BRISTOL and EXETER RAILWAY.—It has not been possible to obtain the quantity of coal passing over this line.

South Devon railway.

The SOUTH DEVON RAILWAY.—The CORNWALL RAILWAY and the WEST CORNWALL RAILWAY obligingly furnish the following return :—

Coal conveyed, year ended 30th June 1868 :—

	Tons.
Over South Devon Railway	56,718
Over Cornwall Railway	10,568
Over West Cornwall Railway	75,919
Total	143,205

Coal consumed, year ended 30th June 1868, on South Devon Railway :—

	Tons.	cwts.
At Stations	177	5
Office	25	0
Engineer	134	6
Total	336	11

On Cornwall Railway :—

Stations and carriage shops	171	0

On West Cornwall Railway :—

Stations	25	0
Total	532	11

Coal consumed in locomotive departments on South Devon, Cornwall, and West Cornwall Railways	20,220	0
Total	20,752	11

Canals.

CANAL DISTRIBUTION.—THE KENNET AND AVON CANAL AND RIVER AVON.

The number of tons of SOMERSETSHIRE coal carried in the year ending January 1869, 74,748 tons. The principal quantities were distributed as follows :

	Tons.	Tons.
Passing eastward from the Somersetshire Coal Canal Junction, total		54,615
Bradford on Avon received	10,120	
Semington (Wilts and Berks Canal Junction)	1,039	
Wilts and Berks Canal	26,358	
Seend	1,928	
Devizes	955	
Newbury	1,009	
Reading, and short of London	1,801	
Passing westward from Dundas Aqueduct, total		20,133

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This was distributed to— Canals.

	Tons.
Bathampton	183
Bath	7,132
Do. gas works	11,764
Hanham for Bristol	1,054
	74,748

Of GLOUCESTERSHIRE coal, the KENNET AND AVON Canal and the River AVON distributed in 1869 from Hole Lane Colliery, Warmley, near Bristol, viâ Avon and Gloucester Tramway and River Avon— Canals.

	Tons.
Westward to Hanham for Bristol	7,418
Eastward from Golden Valley Colliery viâ River Avon and Kennet and Avon Canal	1,379
Westward for Bristol	300
From Parkfield Colliery viâ River Avon.	
Eastward from Hanham to Bath Gasworks	9,051
Eastward from Hanham viâ River Avon and Kennet and Canal	1,564

This coal was distributed between Keynsham, Bath, Seend, and Devizes, and the Wilts and Berks Canal.

ABSTRACT.

	Tons.	Tons.
Somersetshire coal:		
Eastward	54,615	
Westward	20,133	
		74,748
Gloucestershire coal:		
Eastward	10,430	
Westward	7,718	
		18,148
Other coal:		
Eastward		1,564
		94,460

SOMERSETSHIRE COAL CANAL NAVIGATION. Somerset coal canal.

The quantity of coal carried by this canal in 1868 was 75,336 tons.

This is distributed, on the line of the Kennet and Avon Canal to Reading; on the line of the Wilts and Berks Canal to Abingdon; on the line of the North Wilts Canal to Cricklade; on the line of the Kennet and Avon Canal and the River Avon to Bath and (very slightly) to Bristol.

GLOUCESTER and BERKELEY Canal from the 25th March 1868 to 25th March 1869. Gloucester and Berkeley canal.

Stroud Canal and Severn:

By coasting, to Gloucester, 3,295 tons.
Severn to Gloucester, 26,438 tons, from South Wales and the Forest of Dean.*
Coal from Gloucester to Stroud, 5,932 tons.

THE WILTS AND BERKS CANAL.

The quantity of coals carried upon this canal in the past year (1868) was 27,137 tons.

These coals come from the various pits in Somersetshire, pass along the Somerset Coal Canal, and then into the Kennet and Avon Canal at Dundas, and from thence to Lemington, near Melksham, on the Wilts and Berks canal, and are unloaded at the different places between that point and Abingdon it joins the Thames.

* The following is in reply to an inquiry relative to the Gloucester shipments, obligingly furnished by the Gloucester and Berkeley Canal Company:
"I have to inform you that there is little or no coal shipped from Gloucester itself. The return that has been made you has, doubtless, relation to the little harbour of *Lydney*, which is within the *Customs' Port of Gloucester*, and from which a large amount of coal is annually sent. The whole of this has been raised in the Forest of Dean, lying immediately behind Lydney. What little coal we do ship here is also from the Forest of Dean, the Stafford and Shropshire coal brought down here being wholly used for local consumption. I have ascertained from the Custom House here that the return made you as *from the Customs' Port* is substantially trustworthy and accurate. The 16,000 tons you speak of as carried by the Great Western Railway Company was not shipped here. I imagine it was en route for Southampton, but of this I cannot speak with any certainty."

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South Wales coalfield.

MONMOUTHSHIRE, GLAMORGANSHIRE, CARMARTHENSHIRE, and PEMBROKESHIRE, commonly called the SOUTH WALES Coalfield.

This coalfield is the largest in England, and has, with one exception, a greater vertical thickness than any known coalfield in the world. Its greatest length, from Pontypool in the east to Kidwelly on the west, is about 54 miles. From Llantrissant on the south to Tredegar on the north the distance is about 18 miles. A series of sections are given by the Geological Survey, which fully illustrate the conditions of this remarkable coalfield.*

Mr. Hull gives the superficial area of this coalfield as 906 square miles, the greatest thickness of coal measures with coals 10,000 feet, and the number of coal seams from two feet upward as 25, giving 84 feet of workable coal.†

The number of working collieries in this district are as follows:

Appendix, p. 41, 46, &c.

Monmouthshire.—The inspection district of Mr. Lionel Brough	73	collieries.
Glamorganshire, Eastern edge.—Ditto	21	,,
Ditto The inspection district of Mr. Thomas E. Wales	218	,,
Pembrokeshire.—Ditto	16	,,
Carmarthenshire.—Ditto	60	,,
	388	,,

Appendix No. 93, p. 95.

In the Appendix will be found a list of the anthracite collieries; of the district commencing at the top of the Neath Valley, and following the north crop downwards to Kidwelly from east to west and also of the collieries in Pembrokeshire.

COAL PRODUCTION.—The total production of all these collieries since 1860 has been as follows:

	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Monmouthshire	3,800,750	4,650,000	3,750,000	4,075,000	4,028,500	4,125,000	4,445,000	4,569,500	4,250,500	4,275,150	
Glamorganshire, Eastern edge	200,000	325,000									
Glamorganshire—											Not
Aberdare District	1,754,813	1,790,000	2,214,455								complete.
Merthyr District	850,000	925,000	975,000								
South Crop, &c.	1,800,000	1,875,000	2,100,000	6,917,081*	6,948,000†	8,531,336‡	9,376,448	9,092,300	8,959,500	9,179,650	
Pembrokeshire	1,850,000	2,100,000	1,250,000								
Carmarthenshire											

* The detail return gives—

	Tons.
Merthyr	812,778
Gellygare	639,055
Aberdare	2,148,960
Llanwonno	293,288
Lower end of Taff Vale and Llantwit Vadre, &c.	141,000
South outcrop to Neath	655,000
Neath and Vale of Neath	305,000
Glyncorrwg	36,000
Pembrokeshire and Carmarthen	1,041,000
Total	6,917,081

	1864.†	1865.‡
	Tons.	Tons.
Llanelly, Carmarthenshire. Partly shipped at Llanelly and partly used for iron works	486,245	463,123
Neath, Glamorganshire. Shipped at Swansea, Neath, and Briton Ferry, and used for iron and copper works	928,275	641,179
Swansea, Glamorganshire Partly shipped. Bulk used for iron and copper works	651,567	671,863
Briton Ferry, Glamorganshire. Large shipped; small used for iron and copper works	30,629	115,000
Pontyprid, Rhondda Valley, Glamorganshire. Large shipped; small used for iron and copper works. Nearly all shipped at Cardiff	758,699	1,045,189
Merthyr, Rhondda Valley. Some shipped at Swansea and Cardiff; principally used at iron works	1,216,457	1,428,509
Navigation near Aberdare. Shipped at Cardiff and Swansea	236,528	371,416
Pembrokeshire. Used in surrounding district for household purposes	145,797	80,735
Glygaer near Merthyr. Shipped at Cardiff and Newport	57,823	119,399
Bridgend, Glamorgan. A little shipped at Cardiff and Swansea, but principally used for iron making	412,503	997,711
Aberdare Parish. Shipped at Cardiff and Swansea. Used at iron works	2,048,472	1,976,364
	6,948,000	7,911,507
Anthracite shipped from Pembrokeshire and Carmarthenshire		509,475
Ditto used		110,354
Total		8,531,336

The Cardiff Chamber of Commerce has furnished the following valuable information as to the steam coal raised. There are five parishes—Aberdare, Merthyr, Gellygaer, Ystraddyfodwg, and

* See "Formation of Rocks in South Wales and South-western England."—Sir Hy. De la Beche, C.B., Memoirs of Geological Survey. Vol. I.

† "The Coal Fields of Great Britain," by Edward Hull, B.A.

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Llanwonno,—in which this description of coal is produced *for sale*, and the quantities so produced were in— Cardiff steam coal.

	Tons.
1863	2,370,649
1864	2,390,308
1865	2,449,123
1866	2,822,683
1867	2,994,466

The quantities of *bituminous* coal raised for sale in the same period were—

	Tons.
1863	518,052
1864	703,634
1865	1,193,270
1866	1,297,100
1867	1,269,460

This *bituminous coal* was not raised for steam generating purposes.

The quantities of coal produced by the ironmasters for the purposes of consumption in the manufacture of their own iron—

	Tons.
In 1863	1,125,721
1864	1,085,587
1865	1,056,144
1866	1,012,313
1867	981,850

The foregoing figures are taken from the returns made by the collectors of poor rates within the several parishes.

The following returns will have an especial interest, as showing the progress of the coal production of important districts in South Wales in each year, from the parish returns:

COALS raised in the PARISH of ABERDARE.

Year.	——	——	Increase and Decrease.
		Tons.	Tons.
1844	Twelve months ending December	176,953	+
1845	" "	192,950	+ 15,997
1846	" "	223,934	+ 30,984
1847	" "	269,116	+ 45,182
1848	" "	396,378	+ 127,262
1849	" "	434,207	+ 37,829
1850	" "	477,208	+ 43,011
1851	" "	555,708	+ 78,500
1852	" "	680,259	+ 124,551
1853	" "	832,274	+ 152,015
1854	" "	1,008,938	+ 176,709
1855	" "	1,203,847	+ 194,864
1856	" "	1,450,955	+ 247,108
1857	" "	1,447,277	— 3,678
1858	" "	1,408,388	— 38,889
1859	" "	1,632,782	+ 224,394
1860	" "	1,754,813	+ 122,031
1861	" "	1,790,771	+ 35,958
1862	" "	2,214,455	+ 423,604
1863	" "	2,148,969	— 65,486
1864	" "	2,048,472	— 100,497
1865	" "	1,976,364	— 72,108
1866	" "	2,185,571	+ 209,207
1867	" "	2,052,229	— 133,342
1868	" "	2,053,509	+ 1,280
1869	" "	2,141,624	+ 88,115

See Appendix No. 97, p. 96, for returns in detail for 1869. The other detailed returns for several years will be found in MINERAL STATISTICS.

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ABERDARE COAL SALES, distinguishing the COALS used in IRON MANUFACTURE.

Year.	Exported.	Used in Iron Works.	TOTAL.
	Tons.	Tons.	Tons.
1861	1,601,713	189,058	1,790,771
1862	1,999,176	215,279	2,214,455
1863	1,904,275	244,694	2,148,968
1864	1,851,632	196,840	2,048,472
1865	1,756,688	219,676	1,976,364
1866	1,968,932	216,639	2,185,571
1867	1,943,975	108,245	2,052,229
1868	1,984,336	69,173	2,053,509
1869	2,068,570	73,054	2,141,624

From the PARISH of LLANWONNO, in the Pontypridd Union, Glamorgan, we have a return of Coal from the Year 1843, when Coals were first rated to the Poor Rates of this Parish.

		Tons.
Coal raised in the Year	1843	9,300
"	1844	11,830
"	1845	19,200
"	1846	30,000
"	1847	44,500
"	1848	58,057
"	1849	47,956
"	1850	42,880
"	1851	50,568
"	1852	122,283
"	1853	175,382
"	1854	134,202
"	1855	99,873
"	1856	115,721
"	1857	115,109
"	1858	99,203
"	1859	118,637
"	1860	110,220
"	1861	277,869
"	1862	289,820
"	1863	293,288
"	1864	—
"	1865	—
"	1866	395,051
"	1867	367,052
"	1868	361,921
"	1869	379,170

See Appendix No. 96, p. 96 for detail of 1869.

COAL worked in the PARISH of GELLIGAER.

The assistant overseer can only supply the quantities worked since the year 1860.

	Tons.		Tons.
1860	716,156	1865	793,772
1861	584,452	1866	866,895
1862	591,468	1865	891,578
1863	639,055	1868	807,424
1864	764,521	1869	896,118

See Appendix No. 99 and 100, p. 97, for details of 1867, 1868, 1869.

ACCOUNT of COAL raised in the PARISH of YSTRADYFODWG from the 1st of January to the 31st of December, viz. :—

		Tons.
Total for the Year	1863	339,261
"	1864	426,489
"	1865	496,769
"	1866	649,828
"	1867	827,271
"	1868	981,787
"	1869	1,070,731

See Appendix No. 101, p. 98, for detail of Ystradyfodwg.

ANTHRACITE.—This appears to be the fitting place to introduce some notice of anthracite (ἄνθραξ, coal.) A variety of coal containing a larger proportion of carbon and less bituminous matter than common coal. "We see the same series of coal beds becoming so altered in their horizontal range, that a set of beds bituminous in one locality is observed gradually to change into anthracite in another. Taking the coal

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measures of South Wales and Monmouthshire, we have a series of accumulations in which the coal beds become not only more anthracitic towards the west, but also exhibit this change in a plane which may be considered as dipping south-south-east at a moderate angle, the amount of which is not yet clearly ascertained, so that in the natural sections afforded we have bituminous coals in the high grounds and anthracitic coals beneath. This fact is readily observed either in the Neath or Swansea valleys, where we have bituminous coals on the south, and anthracite on the north; and more bituminous coal beds on the heights than beneath, some distance up these valleys, those of the Nedd and Tawe. Though the terms bituminous coal and anthracite have been applied to marked differences, the changes are so gradual that there is no sudden modification to be seen. To some of the intermediate kinds the term 'free burning' has been given, and thus three chief differences have been recognized.*

The term culm is applied both to an inferior kind of anthracite only worked for making lime, or for mixing with clay, and to the small pieces of good anthracite obtained in working the true anthracite beds, and the term culm is applied generally to anthracite in our parliamentary returns. It is also called blind coal, Glance coal, and Kilkenny coal.

There are three very distinct "trades" in anthracite. There is, first, that where the coal is sold exactly as it is worked, "through and through," as it is termed, or through culm, which is used entirely for lime-burning. This coal is not of so pure a kind as that from which the large coal is picked out, and is sometimes called bastard stone coal. The trade in the Neath district is entirely of this kind. In Swansea and Llanelly it is partly of this kind, and partly of the kind where the large coal is picked out, and sold as stone coal for the various purposes to which that coal is applied, leaving the small to be shipped, also for lime-burning purposes, under the name of stone coal culm. In Pembrokeshire no "through culm" is shipped. There is one curious lot of 4,000 tons annually shipped in Swansea under the name of Lambskin, which is almost dust; it is sent to one market, Cardiganshire, where it is used entirely for mixing with clay; the mixture, under the name of fireballs, being used for household purposes. This mixture, made of the ordinary stone coal culm, is also very commonly used in parts of Pembrokeshire and Caermarthenshire.

Anthracite coal is obtained in this country at Bideford in Devonshire, at Walsall in Staffordshire, in the western divisions of the South Wales coalfield, in Ireland, and near Edinburgh. It is found abundantly in America. Professor H. D. Roger's "Transactions of American Geologists" states that in the great Apalachian coalfield, extending 720 miles, with a chief breadth of 180 miles, the coal is bituminous towards the western limit, where it is level and unbroken, becoming anthracitic towards the south-west, where it is disturbed. Anthracitic coal is also found in the coalfields of France, especially in the departments of Isère, the High Alps, Gard, Mayenne, and of Sarth; about 42,271,000 kilogrammes (of 2·2046 avoirdupois pounds each) are produced annually. Anthracite is also raised in Belgium.

Anthracite, now exclusively used for iron making, steam-engines, and for domestic purposes in the United States, was some fifty years since regarded as incombustible refuse, and thrown away.

The following analyses of bituminous and anthracite coals will sufficiently show the differences:—

Locality.	Name of Coal.	Carbon.	Volatile Matter.	Ashes.
	BITUMINOUS.			
Birtley Works, Newcastle-on-Tyne	-	60·50	35·50	4·00
Alfreton, Derbyshire	-	52·46	42·50	2·04
	ANTHRACITE.			
Neath Abbey	Pwlferon Vein, 5th bed	91·08	8·00	0·92
Swansea	Peacock Coal	89·00	7·50	3·50
Ystalyfera	Brass Vein	92·46	6·04	1·50
Cwm Neath	Nine-feet Vein	93·12	5·22	1·50
France	Anthracite, common	79·15	7·37	13·25
„	Côte-d'or	82·60	8·60	8·80
„	Mais Saize	83·80	7·50	9·50
Pennsylvania	Beaver Meadow	92·30	6·42	1·28
„	Shenoweth Vein	94·10	1·40	4·50
„	Black Spring Gap	80·57	7·15	3·28
„	Nealey's Tunnel	89·20	5·40	5·40
Massachusetts	Mansfield Mine	97·00	—	3·00
Rhode Island	Portsmouth Mine	85·84	10·50	3·66
Westphalia	Schafberg, Alexander Seam	82·02	8·69	9·29

* Memoirs of Geological Survey, Henry T. De la Beche.

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ANTHRACITE COAL.

PRINCIPAL LOCALITIES of ANTHRACITE and ANTHRACITOUS COAL, &c., in EUROPE.

	Specific Gravity.	Weight of a Cubic Yard in lbs.
South Wales:—Swansea	1·263	2131
Cyfarthfa	1·337	2256
Yniscedwin	1·354	2284
Average	1·445	2278
Ireland, mean	1·445	2376
France:—Allier	1·380	2207
Tantal	1·390	2283
Brassac	1·430	2413
Belgium:—Mons	1·307	2105
Westphalia	1·305	2278
Prussian Saxony	1·466	2474
Saxony	1·300	2193
Average of Europe	—	2281

The calorific value of anthracite coal is well shown by the following results from Dr. Fyfe's experiments to compare Scotch and English bituminous coals with anthracite, in regard to their evaporative power, in a high-pressure boiler of a 4-horse engine, having a grate with 8·15 square feet of surface; also in a waggon-shaped copper boiler, open to the air, surface 18 feet, grate 1·55.

Kind of Fuel employed.	Pounds burnt per Hour on the Grate.	Duration of the Trial in Hours.	Temperature of the Water.	Pounds of Water evaporated from the initial Temperature by 1 lb. of Coal.	Pounds of Water at 212° from 1 lb. of Coal.	Coal per Hour on 1 Square Foot of Grate.	Time in Seconds of consuming 1 lb. of Coal.	Pounds evaporated per Hour from each Square Foot of Surface.	Remarks.
Middlerig Scotch coal.	81·33	9	45°	6·66	7·74	10·00	44·27	- -	Pressure 17 lbs. per sq. inch.
Scotch coal, different variety from preceding.	108	5	170	6·62	6·89	13·25	33·33	- -	Ditto.
ANTHRACITE -	47·94	8½	45	8·73	10·10	5·88	75·09	- -	Ditto.
Scotch coal, from near Edinburgh.	8·24	8½	50	5·38	6·90	5·31	436·89	3·15	Low pressure, open copper boiler.
English bituminous coal.	6·07	8·4	50	7·84	9·07	3·91	503·08	3·06	Ditto.

Space will not admit of our entering fully into the question of the evaporative power of anthracite; but its advantages under certain conditions are fully established.

In this country anthracite coal is used in the manufacture of iron in the following furnaces:—

Ystalyfera, in Glamorganshire	6	furnaces in blast in 1864.
Yniscedwyn, in Brecknockshire	1	" "
Bryn Amman, in Caermarthenshire	1	" "
Kilgetty, in Pembrokeshire	1	" "

The quantity of anthracite iron made in 1864 being 26,565 tons.

Anthracite coal worked in South Wales in 1864 amounted to 509,475 tons, viz.:—

	Tons.
Pembrokeshire	146,000
Carmarthenshire and Glamorganshire	363,475
	509,475

Anthracite shipped:—

	Tons.
Pembrokeshire, at Saundersfoot, &c.	82,000
Swansea	67,000
Briton Ferry	68,000
Llanelly and Pembray	130,000
Total shipped in 1864	347,000
Total quantity used at ironworks, for household purposes, and sent off by railway, to be used principally for malting	162,475
Total	509,475

In the anthracite districts of South Wales the produce was, according to some local returns, in 1855, 997,500 tons, and in 1856 965,500 tons.*

* These particulars are extracted from Ure's Dictionary of Arts, Manufactures, and Mines. Edited by Robert Hunt, F.R.S.

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The economic value of the several varieties of coal which have been named in the foregoing pages is, of course, a question of great moment in considering the question of the uses of each variety of coals in manufactures, or for the purposes of producing steam navigation. In the Appendix will be found a set of tables, carefully abstracted from the Admiralty coal report, and other sources, showing,— Appendix, Table No. 102, p. 93.

1. *The economic value of Welsh coal.*
2. *The mean composition of average samples of Welsh coal.*
3. *The economic value of Newcastle coal.*
4. *The mean composition of Newcastle coal.*
5. *The economic value of Derbyshire coal.*
6. *The mean composition of Derbyshire coal.*
7. *The economic value of Lancashire coal.*
8. *The mean composition of Lancashire coal.*
9. *The mean composition of various coals.*
10. *The mean composition of Foreign coals.*

From an examination of these,—a satisfactory view of the heating power of these,—the principal varieties of coal in Great Britain, will be obtained.

Distribution of the Coal of South Wales.

The total shipments from the several ports is given below, in such a form as will present the progress of the sea-borne trade for the past twenty years.

Shipments of Coal from the South Wales coalfields since 1850. (*For detailed tables, see Appendix.*) Appendix Table Nos. 103 to 111, p. 101.

—	Newport Shipments.	Cardiff Shipments.*	Swansea Shipments.	Port Talbot Shipments.	Neath Shipments.	Port Cawl Shipments.	Llanelly Shipments.	Milford Shipments.	Total Shipments.	Increase over the previous ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860 - -	6,638,549	12,547,066	4,663,649	554,821	1,372,381	174,892	3,122,839	509,857	29,584,054	12,145,664
1861 to 1869 - -	8,471,410	22,824,900	6,697,064	738,472	2,336,023	507,417	3,175,607	466,264	45,217,166	15,633,112
Totals - -	15,109,959	35,371,975	11,360,713	1,293,293	3,708,404	682,309	6,298,446	976,121	74,801,220	27,778,776

In addition to this it appears desirable to show the actual condition of the shipments from each of the ports. It is thought that a period of 10 years will sufficiently show the conditions under which the increase and decrease have taken place.

* The shipments from Cardiff from 1859 have been as follows :—

Year.	Foreign.		Coastwise.
	Coal.	Iron.	Coal.
	Tons.	Tons.	Tons.
1859	998,187	182,817	—
1860	1,142,522	169,467	—
1861	1,127,232	132,493	—
1862	1,322,531	172,353	—
1863	1,485,655	157,892	—
1864	1,481,657	152,563	839,569
1865	1,450,941	160,854	898,525
1866	1,837,161	142,295	887,358
1867	1,966,097	136,633	876,957

The great increase of trade which has taken place in the last 30 years was materially assisted by the opening of the Taff Vale Railway in 1840, and more recently by the Penarth Dock and Railway.

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The Shipments of Coal from the South Wales Ports.

	1860.						1864.						1869.					
	Coastwise.			Foreign.			Coastwise.			Foreign.			Coastwise.			Foreign.		
	Coal.	Coke.	Anthracite.	Coal.	Coke.	Anthracite.	Coal.	Coke.	Anthracite.	Coal.	Coke.	Anthracite.	Coal.	Coke.	Anthracite.	Coal.	Coke.	Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Newport	627,699	1,587	—	185,731	1,860	—	608,692	1,040	—	281,065	951	—	774,080	13	—	324,427	5,625	—
Cardiff*	767,846	14,156	—	1,125,857	7,214	15	839,569	1,737	602	1,467,314	6,801	—	887,899	1,253	60	2,183,558	5,902	—
Swansea*	179,806	50	47,819	291,825	2,108	1,169	215,113	45	48,865	530,888	1,979	1,765	207,204	618	39,252	494,771	3,387	216
Neath	117,204	95	68,011	12,820	—	920	171,872	45	68,032	28,103	—	210	150,259	65	49,872	50,298	1,587	973
Port Talbot	61,720	245	—	—	—	—	58,599	9	—	1,499	—	—	71,405	100	395	7,375	240	—
Port Cawl	17,081	115	—	—	—	—	16,883	83	—	—	—	—	116,113	137	—	20,354	1,294	—
Llanelly	271,667	69	12,434	78,737	—	11,259	232,882	—	19,828	124,121	28	10,520	151,396	—	2,995	115,952	—	10,881
Milford	22,970	—	22,381	45	—	—	24,490	—	35,287	628	—	—	20,968	—	37,496	—	—	—
Total	2,065,963	16,267	150,645	1,695,015	11,182	13,363	2,168,100	2,959	172,614	2,433,618	9,259	12,495	2,379,324	2,186	129,570	3,196,735	17,985	12,070
Increase	—	—	—	—	—	—	102,137	—	21,969	738,603	—	—	211,214	—	—	763,117	8,726	—
Decrease	—	—	—	—	—	—	—	13,308	—	—	1,923	868	—	773	43,044	—	—	425

* In connection with these returns, the following, although a portion of the table has reference to shipments from other than Welsh ports, conveys much information.

Exports of Coals, &c. to the West Coast of South America.

Year.	Swansea.			Cardiff.		Liverpool.			East Coast.		
	Smelting.	Steam.	Smith's and Coke.	Smelting.	Steam.	Smelting.	Steam.	Cannel and Coke.	Smelting.	Steam.	Coke.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1866	60,293	6,459	173	8,792	—	24,426	7,618	931	20,741	4,698	1,012
1867	36,738	3,297	313	3,358	16,954	13,255	4,496	2,188	11,966	600	775
1868	53,857	5,488	863	773	22,226	18,072	14,517	1,548	14,730	1,140	—
1869, first six months	26,685	2,207	610	1,168	10,809	8,925	3,848	73	7,366	6,125	458

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RAILWAY DISTRIBUTION of the COAL from SOUTH WALES.

Great Western Railway.

The GREAT WESTERN RAILWAY in 1866 carried from the South Wales Railway to stations on its own system, 2,238,342 tons, and for stations beyond the Great Western Railway 94,314 tons.

Of the first quantity the largest quantities were left at the following stations :—

	Tons.
Aberdare, Glamorgan	95,383
Aberdylais, Glamorgan	4,824
Abergavenny, Monmouth	9,767
Abingdon, Berks	2,121
Basingstoke, Hants	33,505
Bath, Somerset	3,759
Bilston, Stafford	3,595
Birkenhead, Cheshire	193,129
Brentford, Middlesex	96,763
Brettel Lane, Stafford	32,356
Bridgend, Glamorgan	4,413
Bridport, Dorset	7,217
Brimscombe, Gloucester	3,963
Britton Ferry, Glamorgan	82,499
Bulls Pile, Gloucester	78,782
Cardiff, Glamorgan	20,730
Carmarthen, Carmarthen	14,433
Cheltenham, Gloucester	19,545
Chepstow, Monmouth	8,868
Chippenham, Wilts	2,778
Cinderford, Gloucester	12,519
Cirencester, Gloucester	18,656
Devizes, Wilts	5,995
Dorchester, Dorset	4,282
Ely, Glamorgan	3,076
Farringdon, Berks	4,713
Gloucester, Gloucester	16,527
Haverfordwest, Pembroke	2,552
Henley, Oxford	4,987
Hereford, Hereford	43,866
Hirwin, Brecan	5,017
Horsehay, Shropshire	10,614
Hungerford, Berks	3,126
Kidwelly, Carmarthen	5,020
Landore, Glamorgan	3,866
Llanelly, Carmarthen	5,556
Llantrissant, Glamorgan	3,103
London, Middlesex	158,371
Ludlow, Shropshire	16,784
Merthyr, Glamorgan	9,075
Milford, New, Pembroke	10,828
Minety, Wilts	4,361
Monmouth, Monmouth	9,269
Mortimer, Berks	2,716
Neath, Glamorgan	45,743
Netherton, Worcester	3,800
Newbury, Berks	12,309
Oxford, Oxford	2,036
Penpergwm, Monmouth	2,021
Pontrilas, Hereford	3,720
Pontypool, Monmouth	28,734
Portskervet, Monmouth	5,696
Port Talbot, Glamorgan	30,089
Reading, Berks	28,174
Rhymney Junction, Glamorgan	38,439
Ross, Hereford	4,634
Round Oak, Stafford	4,634
Salisbury, Wilts	10,628
Shrivenham, Berks	3,500
Slough, Bucks	2,433
Steventon, Berks	2,838
Stourbridge, Worcester	2,585
Stroud, Gloucester	10,673
Swansea, Glamorgan	623,703
Swan Village, Stafford	4,194
Swindon, Wilts	7,859

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Great Western Railway.

	Tons.
Taplow, Bucks	4,234
Tethbury Road, Gloucester	3,395
Thatcham, Berks	2,043
Tipton Basin, Stafford	34,162
Tredegar Junction, Monmouth	14,173
Twyford, Berks	3,613
Usk, Monmouth	4,998
Wantage Road, Berks	3,041
Wednesbury, Stafford	10,000
Westbury, Wilts	14,903
West Drayton, Middlesex	2,320
Weymouth, Dorset	2,010
Windsor, Berks	10,902
Worcester, Worcester	2,993
Wycombe, Bucks	3,160
Yeovil, Somerset	4,174

The GREAT WESTERN RAILWAY.—The coal of the South Wales district is sent by the Great Western Railway, by its own system, and onward by other lines of Railway, as far north as Parkhead, which receives 251 tons; as far east as Harwich, which receives 8 tons; as far west as Newton and Paignton, which places combined receive 124 tons; and as far south as Portsmouth, which receives 6 tons. The district in the immediate vicinity of London receives 28,183 tons of this coal; between Epsom and Worthing 229 tons are distributed; between Sole Street and Dover 286 tons; between Brighton and Three Bridges 1,583 tons; between Gosport and Andover Town 3,369 tons are left; between Southampton and Wimborne 8,978 tons are distributed; between Cambridge and Hampthill 1,333 tons; between Acton and Coventry 292 tons; between Northampton and Peterborough 1,191 tons; between Etruria and Crewe 26,506; and between Tisbury and Feniton 10,398 tons are distributed. Burton receives 4,265 tons, Derby 193 tons, the Black Country 1,467 tons, and Holyhead 468 tons of this coal. 5,184 tons more of the South Wales coal is dispersed in different directions. The largest quantity, 579 tons, being sent to Denton, 75 tons are received at Windermere, and the rest is distributed in very small quantities.

The total quantity of the South Wales Coal carried by the Great Western system to stations beyond the Great Western was in 1866 94,314 tons.

In 1866.—The Great Western carried from South Wales coalfield 2,238,342 tons.
In 1868.— Do. do. 2,553,487 tons.
In 1869.— Do. do. 2,800,790 tons.

Coal brought to London.

Coal brought to LONDON by the GREAT WESTERN RAILWAY from the SOUTH WALES coalfield, 1870.

	Tons.
Aberdare	115,947
Bridgend	688
Briton Ferry	1,094
Bwllfa	20,960
Cardiff	98
Cefn Merthyr	19,777
Cefn Plaskynaston	7,193
Cross Hands	311
Croes Newydd	400
Dare	45,253
Dinas	819
Fforchamman	3,570
Garnant	574
Glyn Neath	3,257
Hirwain	7,756
Llancaich	7
Llanelly	109
Llangonoyd	10
Llanhilleth	641
Llansamlet	6
Llantrissant	113
Lougher	6
Lower Duffryn	78
Maesteg	28
Merthyr Steam	1,722
Middle Duffryn	22,008
Mountain Ash	4,085
Navigation	43,072
Neath	12
Oullwyn	176
Pantyffynan	117
Pembrey	29

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Great Western Railway.

	Tons.
Quaker's Yard Steam	2,998
Penrhwfer	8
Pontypool	563
Port Talbot	83
Powells Duffryn	136
Pyle	220
Resolven	6,492
Rhymney	57
Sirhowey	81
Squborwen Merthyr	504
Swansea	4,665
Tonyrefail	227
Tredegar Junction	259
Vochriew	2,305
Totals	318,514

RETURN of the quantity of coal and coke forwarded by the VALE OF NEATH line during 1867, 1868, and 1869. Vale of Neath Railway.

Stations.	1867.		1868.				1869.			
	For Inland Stations.	For Shipment.	For Inland Stations.		For Shipment.		For Inland Stations.		For Shipment.	
	Tons.	Tons.	Tons.	cwts.	Tons.	cwts.	Tons.	cwts.	Tons.	cwts.
Merthyr	2,018	52,862	8,233	10	78,956	0	60,189	0	51,869	0
Aberdare	118,142	96,354	159,450	19	96,327	8	207,593	6	93,613	1
Dare Junction	110,959	252,822	137,262	11	234,079	16	175,405	11	294,881	3
Hirwain	86,115	164,854	126,520	17	159,181	2	80,616	7	137,147	13
Glyn Neath	1,179	19,126	5,183	7	32,249	10	5,597	0	41,677	0
Resolven	2,045	5,124	2,275	18	6,711	19	1,949	15	35,525	6
Total	320,458	591,142	438,927	2	607,505	15	531,350	19	654,713	3
Increase			118,469	0	16,363	0	92,423	0	47,208	0

THE LONDON AND NORTH-WESTERN RAILWAY carried from the South Wales coalfield in 1867 a total quantity of— London and North-western Railway.

	1867. Tons.	1868. Tons.
From BRECONSHIRE	27,868	30,345
From MONMOUTHSHIRE	29,638	17,303

The largest quantities from BRECONSHIRE in 1867 were delivered at the following stations :—

	Tons.
Abergavenny, Monmouth	10,908
Birkenhead, Cheshire	111
Birmingham, Warwick	12
Bromfield, Shropshire	19
Broome, do.	26
Bucknell, do.	35*
Clydach, Brecon	4,165
Craven Arms, Shropshire	57
Gark, Brecon	133
Govilan, Monmouth	8,248
Hereford, Hereford	1,110
Kingsland, G. W., Hereford	73
Kington, do.	343
Leominster, do.	507
Llandrindod, Radnor	56
London, Middlesex	73
Reading, Berks	1,559
Titlay, Hereford	68
Train Inn, do.	60

The coal from the Breconshire coalfield is carried by the London and North-western system, for the Caledonian line, as far north as Friockheim, Forfar, which receives two tons, and as far south as Norwood, and as far west as Llanwrtyd.

* This was carried for the North Staffordshire line.

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London and North-western Railway.

The London and North-western also carried from Breckonshire in 1868—

	Tons.
To stations west of Warrington to Liverpool	20
„ between Manchester and Leeds	9
„ Macclesfield branch	10
„ between Crewe and Shrewsbury	9
„ between Shrewsbury and Hereford, including Central Wales branch	1,872
„ on Merthyr and Abergavenny branch	24,146
„ between Crewe and Rugby	75
„ on Rugby and Stamford branch	43
„ on Blisworth and Peterboro' branch	46
„ on Bletchley and Cambridge	550
„ between Rugby and London	130
To London	119
Carried to other railways	3,502
Total	30,345

From MONMOUTHSHIRE in 1867 the largest quantities were delivered to the following stations:—

	Tons.
Abergavenny, Monmouth	172
Berrington, Hereford	19
Birkenhead, Cheshire	25,112
Clydach, Brecon	1,453
Govilan, Monmouth	288
Kington, Hereford	158
London, Middlesex	1,210
Pembridge, Hereford	74
Roade, Northampton	168
Spon Lane, Stafford	70
Train Inn, Hereford	47
Wednesbury, Stafford	499
Willenhall, do.	20
Wolverhampton, do.	236

And from Monmouthshire this line carried in 1865 39,689 tons, and in 1868 as follows:—

	Tons.
To stations between Birkenhead and Chester	14,010
„ „ Crewe and Holyhead	320
„ „ Crewe and Shrewsbury	6
„ „ Shrewsbury and Hereford, including Central Wales branch	8
On the Merthyr and Abergavenny branch	803
To stations between Stafford and Welshpool	86
„ „ Crewe and Rugby	32
„ „ Stafford and Birmingham	173
„ „ Birmingham and Rugby	645
„ on Buckinghamshire branch	14
To London	781
Carried to other lines:—	
For Great Western	23
For London, Brighton, and South Coast	402
Total	17,303

The most northerly point to which this coal is carried by means of the London and North-western system is Harecastle, the most southerly London, and the most westerly Kington.

	Tons.
The Midland Railway received from the South Wales coalfield in 1866, and distributed it between Cam and Charfield	986
In 1867	1,637
In 1869	390

COAL brought to LONDON by the London and North-western Railway from the South Wales Coalfield in 1870.

	Tons	cwts.
Aberdare	27,382	12
Blaina	213	6
Bryn Amman	428	1
Bryn Hall	1,474	12
Bryn Mawr	36	10
Cefn Merthy	13,811	0

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	Tons.		Tons.
Croes Newydd	9	3	
Cross Hands	1,388	19	
Dare	21,675	0	
Ebbw Vale	324	14	
Garnant	360	8	
Glyn Neath	1,171	9	
Hirwain	15,545	14	
Llanelly	25	10	
Llannilleth	899	3	
Merthyr	30,364	11	
Mountain Ash	5,496	15	
Neath	15	0	
Onllwyn	286	15	
Pantyffman	642	5	
Pontardulais	68	0	
Pontypool Road	5	17	
Quaker's Yard Steam	1,326	10	
Resolven	76	8	
Rhymney	15	12	
Swansea	402	15	
Tredegar	64	0	
Tredegar Junction	425	12	
Voehriew	36	14	
Total	123,972	15	

The CAMBRIAN RAILWAY carried in 1868 from the South Wales Coalfield 11,381 tons. The largest quantities were left at the following stations:— Cambrian Railway.

	Tons.
Oswestry	588
Llynclys	234
Llanymynech	218
Welshpool	44
Scafele	44
Llanbrynmair	35
Cemmes Road	218
Machynlleth	1,821
Glandovey	60
Borth	179
Llanfihangel	480
Bow Street	643
Aberystwith	4,783
Aberdovey	377
Towyn	986
Llwyngwvil	274
Penmaenpool	59
Harlech	34
Talsarnam	56
Penrhyndendraeth	196

RHYMNEY RAILWAY.—STATEMENT of Coal Traffic carried over the Rhymney Railway during the Years 1867 and 1868. Rhymney Railway.

	1867.		1868.	
	Tons.	cwts.	Tons.	cwts.
Total tonnage carried over the Rhymney Railway	686,172	0	659,754	0
Coal included in the above, and which may also be included in the return of other companies:—				
Coal received from the Great Western Railway at Hengoed	104,896	18	154,287	6
Ditto delivered to ditto ditto ditto	122,170	8	127,781	19
Ditto received from the Brecon and Merthyr Railway Company at Deri Junction	—		3,257	19
Coal received from the Brecon and Merthyr Railway Company at South Bargoed Junction	41	5	—	
Coal delivered to the Brecon and Merthyr Railway Company at South Bargoed Junction	174	5	46	2
Coal carried over the Rhymney Railway Company's Bargoed Branch by the Brecon and Merthyr Railway Company	28,296	17	25,453	0
Coal carried over the Brecon and Merthyr Company's Bargoed Branch by the Rhymney Railway Company	124,025	18	163,504	10
Coal received from the Monmouthshire Railway Company	368	4	898	11

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Taff Vale Railway from 1841.

Taff Vale Railway.

Statement of Traffic conveyed on the Taff Vale Railway.

Year.	Coal and Coke conveyed over the Taff Vale Railway by all Trains.	Coal and Coke to Cardiff and Penarth Junction by all Trains.	Coal and Coke conveyed by Taff Vale Railway Trains.			Coal and Coke conveyed over Taff Vale Railway by Great Western Railway and London and North-western Railway Trains.
			To Quaker's Yard Junction.	To Mountain Ash Junction.	Sold retail or otherwise disposed of.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	41,669	—	—	—	—	—
1842	114,516	—	—	—	—	—
1843	152,100	—	—	—	—	—
1844	187,740	—	—	—	—	—
1845	265,040	—	—	—	—	—
1846	294,175	—	—	—	—	—
1847	360,324	336,769	—	—	23,555	—
1848	502,029	450,569	—	—	51,460	—
1849	530,145	497,045	—	—	33,100	—
1850	594,222	564,698	—	—	29,524	—
1851	612,716	546,456	—	—	66,260	—
1852	711,962	607,240	—	—	104,722	—
1853	874,362	704,502	—	—	169,860	—
1854	1,025,145	834,504	—	—	190,641	—
1855	1,155,904	980,632	—	—	175,272	—
1856	1,394,394	1,230,396	—	—	163,998	—
1857	1,468,527	1,337,830	—	—	130,697	—
1858	1,445,157	1,313,388	—	—	131,769	—
1859	1,759,422	1,582,211	—	—	177,211	—
1860	2,132,995	1,929,525	—	—	203,470	—
1861	2,297,250	2,092,505	—	—	204,745	—
1862	2,540,657	2,296,657	126,998	—	116,979	23
1863	2,772,011	2,450,395	196,579	—	125,037	—
1864	2,842,049	2,414,836	165,941	74,437	186,812	23
1865	2,855,198	2,501,689	102,611	37,024	212,075	1,799
1865	3,248,235	2,877,192	72,732	27,195	245,383	25,733
1867	3,381,045	3,021,641	102,829	12,414	228,255	15,906
1868	3,540,324	3,159,895	135,104	4,685	233,703	6,937
1869	3,810,067	3,307,668	148,007	3,411	338,978	—

Sundry Railways.

—	1868.	1869.
	Tons.	Tons.
The Monmouthshire Railway and Canal Company carried - - -	1,389,660	1,528,354
The Swansea Vale Railway carried -	390,183	398,096
Llanelly Railway carried - -	510,781	—
(Of this 160,000 tons were shipped by Llynvi and Ogmore Railway.)		

Llynvi and Ogmore Railway.

Return of the Quantity of Coal conveyed over the Llynvi and Ogmore Railway during the Years 1867 and 1868.

—	Not passing to or from other Lines.	Passing to other Lines.	Total.
	Tons.	Tons.	Tons.
1867	416,302	46,051	462,353
1868	398,073	41,235	439,308

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The South Wales Mineral Railway—

	Tons.
1867	120,619
1868	107,709

A large portion of this passes on to the Great Western Railway; the remainder is shipped. The whole is raised from pits or levels upon this line of railway.

The manufacture of patent fuel has been largely carried on in South Wales. The following notice, therefore, will appropriately find a place here. Patent fuel.

Under the name of patent fuel a great many attempts have been made to utilise waste material. In countries where charcoal is abundant charcoal dust mixed with pitch has been employed, and attempts have been made to utilise the immense quantities of saw-dust produced in the north of Europe by mixing it with clay and tar. Passing over the several kinds of artificial fuel which have been made on the continent, the productions of this character made in this country must be described.

Wylam's patent fuel is small coal and pitch moulded together into bricks by pressure. The pitch is obtained by the distillation of coal tar, from which naphtha and a peculiar oil are separated, leaving the pitch. This pitch is ground fine and mixed with small coal, and in this state it is passed, by a very ingenious application of the Archimedean screw, through a retort maintained at a dull red heat, by which it is softened for being moulded, which is effected by a kind of brick-making machine under enormous pressure.

Warlich's patent fuel is similar in character, but he adds a little common salt or alum to prevent the evolution of too much smoke, and the fuel bricks are subjected to a temperature of 400° Fahrenheit for eight hours, by which the more volatile constituents are driven off.

Wood's fuel is prepared by mixing small coke or coal in a heated state with tar or pitch in a common pug-mill, after which it is moulded in the ordinary manner.

Bessemer's process consists merely in exposing coal-dust to a temperature of 600° Fahrenheit. By this the bituminous matter of the coal becomes softened, and the whole can be pressed into a firm block.

Grant's patent. This fuel is composed of coal-dust and coal-tar pitch; these materials are mixed together, under the influence of heat, in the following proportions:—20 lbs. of pitch to 1 cwt. of coal-dust, by appropriate machinery, consisting of crushing-rollers for breaking the coal in the first instance sufficiently small so that it may pass through a screen, the meshes of which do not exceed a quarter of an inch asunder; 2ndly, of mixing-pans or cylinders, heated to a temperature of 220°, either by steam or heated air; and, 3rdly, of moulding machines, by which the fuel is compressed, under a pressure equal to five tons, into the size of a common brick; the fuel bricks are then whitewashed, which prevents their sticking together, either in the coal bunkers or in hot climates. The advantages of these artifical fuels over coal may be stated to consist, first, in its efficacy in generating steam; secondly, it occupies less space; that is to say, 500 tons of it may be stowed in an area which will contain only 400 tons of coal; thirdly, it is used with much greater ease by the stokers or firemen than coal, and it creates little or no dirt or dust, considerations of some importance when the delicate machinery of a steam-engine is considered; fourthly, it produces a very small proportion of clinkers, and thus it is far less liable to choke and destroy the furnace bars and boilers than coal; fifthly, the ignition is so complete that comparatively little smoke, and only a small quantity of ashes, are produced by it; sixthly, from the mixture of the patent fuel, and the manner of its manufacture, it is not liable to enter into spontaneous ignition.

A great many other persons have either patented processes for the preparation of artificial fuel, or published suggestions. These are so nearly alike that a few of them only require any notice.

Cobbold agitates peat in water to separate the earthy matter, and then allows the peat to subside, and consolidates it.

Godwin makes brick of mud or clay with pitch or coal.

Oram employs tar, coals, and mud.

Hill takes the residuary matter after the distillation of peat, and mixes it with pitch.

Holland mixes lime or cement with tar and small coals.

Ransome cements small coal together by a solution of silicate of soda.

From the Admiralty Coal Inquiry's Report we obtain the following analyses of several of the more important artifical fuels:—

Name of Fuel.	Specific Gravity of Fuel.	Carbon.	Hydrogen.	Sulphur.	Oxygen.	Ash.
Warlich's	1·15	90·02	5·56	1·62	—	2·91
Livingstone's	1·18	85·07	4·13	1·45	2·03	4·52
Lyon's	1·13	86·36	4·56	1·29	2·07	14·66
Bell's	1·14	87·88	5·22	0·71	0·42	4·90
Holland and Green's	1·30	70·14	4·65	—	—	13·73
Wylam's	1·10	79·91	5·69	1·25	6·63	4·54

See Appendix Tables No. 103, pages 98 to 100.

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See Appendix No. 104, p. 100.

Description of the Fuel tried.	Number of Trials from which the Average Results are deduced.	Pounds of Water evaporated to 1 lb. Coal consumed, calculated from 100° constant Temperature of the Feed Water.	Cubic Feet of Water evaporated per Hour, calculated from 100° constant Temperature of the Feed Water.	Per-centage of Clinker.	Per-centage of Ash.	Per-centage of both Clinker and Ash.	Smoke.
PATENT FUEL - - -	1	8·59	48·85	1·97	4·21	6·18	
Ditto - - - -	3	9·11	48·2	2·4	3·86	6·26	Black smoke.
Ditto Captain Cochrane's	1	4·01	22·09	7·76	32·5	40·26	No record.
Ditto Holland's - -	6	7·94	39·51	1·7	6·3	8·	Light brown.
Ditto Lyon's - -	2	8·98	47·4	2·86	4·37	7·24	No record.
Ditto Temperly's	3	8·5	42·45	·99	7·19	8·19	Ditto.
Ditto Warlich's - -	8	8·7	44·12	2·4	7·64	10·04	Little brown smoke.
Ditto ditto - -	4	9·16	46·47	3·03	5·62	8·65	No record.*

THE COALFIELDS OF SCOTLAND.

Scotland.

The great coalfield of Scotland has, from the coast of Ayr to Fifeness, an extreme length of 94 miles, with an average breadth of about 25 miles. The actual workable surface of coal has been variously computed by Professor Rogers, Mr. J. Nichol, Mr. Bald, and others, the general determination being somewhere between 1,450 and 1,750 square miles.

The Lothians section contains from 50 to 60 coal seams, exceeding one foot in thickness, the thickest being 13 feet. The "great seam" has been traced from its outcrop at Gilmerton, under the valley of the Esk, to the valley of the Tyne, about 12 miles. Below this, at a depth of 250 fathoms, is the "north greens" coal, yielding the "parrot coal," which is famous as a gas producing coal. Linlithgow produced the well-known "Boghead coal," which occurs in a small area, and is of an average thickness of about 18 inches, though in some places it is found to be not less than 30 inches. There are several seams of "brown cannel" much used as gas coals in Edinburghshire and Fifeshire (see section on cannel coal.)†

Mr. Ralph Moore gives a section of the Lanarkshire coal for a total thickness of 750 fathoms down to the Hurlet coal.

UPPER SERIES, 840 feet.—From the "upper four-foot coal" downwards, with ten coal seams from two feet upwards in thickness, and sundry beds of blackband ironstone.

MIDDLE SERIES, 960 feet.—From the "moorston rock," which appears to be analogous to the "millstone grit," down to the Garnkirk limestone.

LOWER SERIES, 2,200 feet.—Representing the "carboniferous limestone" of England, containing several coals, including the "Lesmahagow gas coal, and the "Hurlet coal," having a thickness of six feet, and several courses of blackband ironstone.

The western district was surveyed at the suggestion of the local committee of the British Association in Glasgow.‡ He classed the coal measure series as follows:—

1st. THE UPPER RED SANDSTONE SERIES.—This consists of red and variegated sandstones, shales, and some thin seams of coal.

2nd. THE UPPER OR FRESHWATER COAL SERIES.—This contains about 30 seams of coal, seven or eight of which are workable.

The "first or upper coal" seam is from two and a half to three feet thick in Old and New Monkland, but in Dalziel, Dalserf, and Hamilton it sometimes measures from six to ten feet.

The "second and third coal" average when separate each about four feet; when united, they form eight or nine feet of coal.

The "fourth coal" is generally too thin to be workable, but in the neighbourhood of Glasgow it measures two and a half feet.

The "fifth coal" or "splint" measures from two and a half to six feet thick. Below the splint there are three seams of workable coal; the first is two and a half feet, the next four feet, and the lowest two feet thick. The distance from the first or "ell coal" to the fifth or "splint coal" is about 30 fathoms.

The area in which these beds occur extends in Lanarkshire from Glasgow to Carluke, a distance of 20 miles, and its breadth varies from six to fifteen miles.

3rd. THE UPPER MARINE OR LIMESTONE SERIES.—This portion of the strata contains only two or three very thin seams of coal.

4th. THE LOWER COAL SERIES.—The lowest coal of this series is the cannel coal, measuring from two to three feet thick. The main coal lies 15 fathoms above the cannel coal. Blackband ironstones are associated with this coal series.

5th and 6th. THE LOWER MARINE SERIES and the OLD RED SANDSTONE.—Underneath the ironstone and shales lies the main limestone, beneath which is a layer of aluminous shale much used

* See Ure's Dictionary of Arts, Manufactories, and Mines. Edited by Robert Hunt, F.R.S.

† See section on cannel coal and bituminous shales at the end of this chapter.

‡ Report of the Tenth Meeting of the British Association for the Advancement of Science held in Glasgow in August 1840.—*Transactions of Sections*, p. 89.

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in the manufacture of alum. This bed is followed by a seam of coal from four to five feet thick, of a sulphurous nature, containing nodules of iron pyrites.

At Brora, in Sutherlandshire, we have a coal formation belonging to the lower divisions of the oolite period

Brora coalfield

The Brora coalfield is the most remarkable example. The Rev. Dr. Buckland and Sir C. Lyell, after visiting it in 1824, had expressed an opinion that the strata there were wholly unconnected with the proper coal formation below the new red sandstone, and were in fact the equivalent of the oolitic series; an opinion confirmed by the subsequent researches of Sir R. Murchison.* The Brora coalfield forms a part of those secondary deposits which range along the south-east coast of Sutherlandshire, occupying a narrow tract of about 20 miles in length and 3 in its greatest breadth.

One stratum of the Brora coal pit is a coal shale, containing abundance of a reed-like striated plant of the natural order *Equisetum*. From this coal shale the next transition upwards is into a purer bituminous substance approaching to *jet*, which constitutes the great bed of coal. This is from 3 feet 3 inches to 3 feet 8 inches thick, and is divided nearly in the middle by a thin layer of impure indurated shale charged with pyrites, which, if not carefully excluded from the mass, sometimes occasions spontaneous combustion upon exposure to the atmosphere; and so much indeed is that mineral disseminated throughout the district, that the shales might be generally termed "pyritiferous." Inattention on the part of the workmen in 1817, in leaving a large quantity of this pyritous matter to accumulate in the pit, occasioned a spontaneous combustion, which was extinguished only by excluding the air; indeed the coal pit was closed in and remained unworked for four years. The fires broke out again in the pit in 1827.

The purer part of the Brora coal resembles common pit coal, but its powder has the red ferruginous tinge of pulverised lignites. It may be considered one of the last links between lignite and true coal, approaching very nearly in character to jet, though less tenacious than that material; and, when burnt, exhaling but slightly the vegetable odour so peculiar to all imperfectly bituminised substances. The fossil remains of shells and plants prove the Brora coal to be analagous to that of the eastern moorlands of Yorkshire, although the extraordinary thickness of the former compared with any similar deposit of the latter (which never exceeds from 12 to 17 inches) might have formerly led to the belief that it was a detached and anomalous deposit of true coal, rather than a lignite of any of the formations *above* the new red sandstone. Such misconception might more easily arise in the infancy of geology, when the strata were not identified by their fossil organic remains.

Distribution of Coal from the Scotch Coalfield since 1851.

The total shipments from the chief western ports have been as follows:—(*For details, see Appendix.*)

Appendix Tables Nos. 111, 112, 113, 114, 115, 116, 117, p. 102.

——	Glasgow.	Irvine.	Ayr.	Greenock.	Troon.	Ardrossan.	Port Glasgow.	Total Shipments.	Increase over previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	1,317,556	3,406,722	761,408	326,566	—	—	57,553	5,866,805	4,337,626
1861 to 1869	2,083,437	1,399,480	1,111,278	875,671	2,828,287	1,518,636	119,084	9,935,873	4,066,068
Total -	3,400,993	4,806,202	1,872,686	1,202,237	2,828,287	1,518,636	176,637	15,805,678	—

The shipments from the eastern ports since 1851 have been as follows:—

Appendix Table, Nos. 118, 119, 120, 121, 122, 123, p. 104.

——	Grange-mouth.	Borrow-stoness.	Kirkaldy.	Leith.	Dundee.	Alloa.	Granton.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1851 to 1860	387,671	1,839,406	773,233	355,988	341,440	715,552	—	4,413,290	1,049,837
1861 to 1869	953,736	2,363,587	1,657,605	745,382	376,566	787,344	244,776	7,128,996	2,715,706
Total -	1,341,407	4,202,993	2,430,838	1,101,370	718,006	1,502,896	244,776	11,542,286	—

* Geological Transactions for 1827, p. 293.

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Shipments for Scotland.

Shipments from the smaller Ports of Scotland.

	Tons.
1851	3,121
1852	525
1853	618
1854	821
1855	19,149
1856	6,791
1857	1,351
1858	1,052
1859	722
1860	312
Total	34,462

	Tons.
1861	712
1862	632
1863	1,869
1864	2,655
1665	1,298
1866	1,556
1867	2,960
1868	1,369
1869	719
1870	
Total	13,770

To place the condition of the Scotch coal trade in as clear a view as possible, the following table of the coastwise and foreign exports from the various ports in each of four years, separated by ten years, is given :—

	1839.		1849.		1859.		1869.	
	Coastwise.	Foreign.	Coastwise.	Foreign.	Coastwise.	Foreign.	Coastwise.	Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Leith	30,459	18,356	1,249	20,911	7,433	38,096	10,716	84,397
Granton	—	—	—	—	—	—	20,699	43,715
Borrowstoness	125,789	33,029	46,975	61,693	113,329	167,888	74,392	197,571
Grangemouth	69,383	11,151	4,333	19,065	2,704	47,334	1,803	103,136
Alloa	—	—	40,091	32,411	15,034	76,081	12,805	96,167
Kirkaldy	46,960	7,138	39,439	41,058	39,026	60,695	56,272	203,466
Montrose	—	20	—	—	—	—	—	—
Dundee	244	814	—	9,762	2,855	37,633	1,199	52,173
Aberdeen	—	120	—	200	—	150	—	450
Greenock	1,389	15,955	305	22,640	2,221	44,464	9,868	104,663
Stornoway	—	—	—	115	—	—	—	—
Port Glasgow	18	3,768	—	8,527	110	3,284	9,540	17,988
Arbroath	—	—	—	—	—	311	—	—
Glasgow	100,922	20,723	78,651	42,421	78,682	60,716	128,741	149,376
Ardrossan	—	—	—	—	—	—	123,017	75,370
Irvine	248,417	19,224	188,782	71,066	234,288	103,154	—	—
Troon	—	—	—	—	—	—	367,890	119,080
Ayr	73,457	151	73,089	896	75,108	1,936	110,176	2,508
Campbeltown	1,800	40	31	—	—	—	—	—
Perth	—	—	—	—	—	—	—	11
Peterhead	—	—	—	—	—	52	—	—
Dumfries	—	—	—	—	—	520	—	—
Kirkwall	—	—	—	—	—	—	—	28
Stranraer	—	—	—	—	—	—	—	230
Total Shipments	698,838	130,489	472,945	330,765	570,790	642,314	917,118	1,250,319

In 1849, therefore, we see there was a decrease in the coal sent coastwise to the extent of 225,893 tons, but an increase in the quantity sent to foreign countries of 200,276 tons.

In 1859 there was an increase over the shipments sent coastwise in 1849 of 97,845 tons, but it was still below the shipments of 1849 by 128,048 tons. The foreign shipments in 1859 had increased by 311,549 tons.

In 1869 we have a much more considerable increase, the coal sent coastwise having risen by 346,328 tons, and that exported to foreign countries by 608,005 tons.

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RAILWAY DISTRIBUTION FROM THE SCOTCH COALFIELD.

North British Railway.

The NORTH BRITISH Railway Company carried in 1867 from 168 collieries situated on their system and from their stations within the coal areas to other stations on their line, about 2,739,900 tons. The following were the names of the collieries sending the largest quantities, and the names of the towns receiving the highest tonnage. The detailed return was given for the month of December only, but the authorities on the railway conceived this month to give a fair average retnrn. The following table is computed from this return :—

	Tons.
Edinburgh, Edinburgh	123,912
Haymarket, ditto	59,724
Bathgate, Linlithgow	104,928
Leith, Edinburgh	99,612
Causewayend, Stirling	54,660
St. Leonard's, Edinburgh	49,956
Burntisland, Fife	105,264
Whifflet, Lanark	39,384
Gartgill, ditto	59,496
Addiewell, Linlithgow	57,444
Cowlairs, Lanark	36,024
Silloth, Cumberland	41,340
Carlisle, ditto	26,280
Coatbridge, Lanark	70,680
Alexandria, Dumbarton	49,128
Macmerry	19,536
Bo'ness, Linlithgow	29,304
Portobello, Edinburgh	13,656
Stirling, Stirling	46,980
Charlestown, Fife	101,568
Stations on other Lines	229,512

CALEDONIAN RAILWAY.

Ca'edonian Railway.

Statement shewing the tonnage of coal and dross produced from the pits on the Caledonian system during the year ending 31st July 1867.

	Tons.
Gross tonnage put out of pits in Lanarkshire	3,133,035
„ „ Stirlingshire	17,444
„ „ Renfrewshire	48,481
Gross Total	3,198,960

	Tons.
Shipped at Granton	100,629
„ Leith	39,415
„ General Terminus	206,704
„ Port Glasgow	3,936
„ Greenock	112,350
„ South Alloa	2,721
„ Wemyss Bay	1,712
„ Stranraer	6,186
Used for steam purposes by the Company	220,315
Handed to Forth and Clyde Canal at Dundyvan Basin	76,645
„ London and North-western Railway	33,554
„ North British Railway	117,773
„ Glasgow and South-western Railway	11,740
„ Forth and Clyde Railway	16,875
„ Highland Railway	16,726
„ Great North of Scotland Railway	551
Used by the public at stations on the Caledonian line	2,231,128
Gross Total	3,198,960

GREAT NORTH OF SCOTLAND RAILWAY.

Great North of Scotland Railway.

Statement of the quantity of coals carried on the Great North of Scotland Railway, as laid down in red on accompaning map, for twelve months to 31st July 1868.

	Tons.
Coals received from other lines of railway	8,457
Coals taken at seaports	94,514
Total quantity carried	102,971

NOTE.—There are no coalfields near the line of the Great North of Scotland Railway.

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The coal received by this railway company was distributed between Aberdeen, Peterhead, Fraserburgh, Banff, Portsey, and Lossiemouth on the coast, and Ballater, Aboyne, Alford, Inveramsay, Huntly, Dufftown, Keith, Craigellachie, Nethybridge, and other stations on the Great North of Scotland system.

Glasgow and South-western Railway.

Glasgow and South-western Railway.

Coals conveyed on the Glasgow and South-western Railway and branches for the year 1867.

	Tons.
Coal shipped	897,999
For stations	340,912
For iron works	499,876
Total	1,738,787

The Highland Railway, from Perth, by Forres, Elgin, Inverness, Dingwall to Golspie, carried, in 1868,

	Tons.
From other railways	45,901
„ Sea ports	5,933
„ Coalfields	*Nil.*
Total	51,834

IRELAND.

Ireland. Appendix List of Collieries. page 54.

The coal measures of Ireland, if we include in this term the millstone grit, occupy large tracts of land in that country, and are upon the whole analogous in general mineral characters and organic contents to those of England. The same absence of limestone, the same kind of successions of sandstones and shales, is remarked in them. Anthracite, or stone-coal, like that of South Wales, is found in the Leinster and Munster districts; bituminous coal occurs in Connaught and Ulster. In Ulster the principal collieries are at Coal Island and Dungannon. The Munster coal district is stated by Mr. Griffith to be of greater extent than any English coalfield, but it is much less productive. At Ballycastle the coal is found in connection with basalt.—*Phillips.**

Mr. Hull remarks, "that Ireland was once covered over two thirds of its extent by coalfields is a proposition which we may confidently affirm on geological grounds; but the misfortunes of the sister isle began long before the landing of Strongbow, for old father Neptune has swept the coal and coal strata clean into his lap, and left little but a bare floor of limestone behind. In plain words, if we examine a geological map of Ireland we shall find that the carboniferous limestone overspreads its greater part; and as we always find in England that this formation is ultimately surmounted by coal measures, so we may infer there was the same order of succession here, before the sea, which more than once overwhelmed the country after the carboniferous epoch, remorselessly swept away the more valuable portion of this system of rocks."†

The coal districts of Ireland are divided into *the Ulster Coalfield*, extending over the counties of Antrim, Tyrone, and Cavan, in which four collieries only are working;

The Connaught Coalfield, the Lough Allen district, in the counties of Sligo, Leitrim, and Roscommon, in which eight collieries are at work;

The Leinster Coalfield, Castlecomer district, in the counties of Kilkenny, Carlow, and Queen's county, in which about eight collieries are at work; and

The Munster Coalfield, in the Slievardagh, Dunhallow, and Limerick districts, in which about twelve collieries are at work.

It has been difficult to obtain returns of the actual quantities worked from those collieries.

	Anthracite.	Bituminous.
	Tons.	Tons.
In 1866 the returns were	68,750	55,000
1867 „	75,000	50,000
1868 „	74,500	52,450
1869 „	127,923	
1870 „	Not complete.	

DISTRIBUTION OF COAL BY RAILWAYS.

Beyond the Coalfields over the Southern and South-western Counties.

The London and South-western Railway, in addition to the coal received from the London and North-western, the Great Northern, and Midland Companies, at Willesden Junction, which quantities are included in the returns from those railways, received as follows:—

	Tons.
From London, Middlesex	19,460
„ Reading, Berks	2,624
„ Havant, Hants	1,037
„ Portsmouth, do.	791

* Phillips's Geology.

† Coalfields of Great Britain.

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	Tons.
From Basingstoke, Hants	20,786
„ Southampton, do.	42,602
„ Redbridge, do.	2,087
„ Eling, do.	454
„ Lymington, do.	91
„ Wimborne, Dorset	19,460
„ Poole, do.	2,981
„ Dorchester, do.	761
„ Weymouth, do.	2,198
„ Salisbury, Wilts	27,709
„ Templecombe, Somerset	24,508
„ Yeovil, do.	2,465
„ Crediton, Devon	182
„ Frensington, do.	43,499
„ Topsham, do.	2,627
„ Exmouth, do.	1,412

The coal taken from LONDON was distributed at all the towns and stations on this railway and its branches as far west as Templecombe. The largest quantities being taken by the following towns:—

	Tons.
Kingston, Sussex	553
Windsor, Berks	579
Virginia Water, Surrey	371
Epsom, do.	1,581
Leatherhead, do.	814
Surbiton, do.	549
Esher, do.	301
Chertsey, do.	914
Guildford do.	2,885
Petersfield, Hants	613
Midhurst, Sussex	342
Tongham, Surrey	1,888
Farnham, do.	1,613
Alton, Hants	1,155
Basingstoke, Hants	938
Winchester, Hants	666

Of the quantity of coal distributed from READING:—

	Tons.
Kingston, Surrey, received	437
Sunningdale, Berks, received	512
Bracknells, Berks, received	900
Chertsey, Surrey, received	143

Of the coal received at and forwarded from HAVANT, 867 tons were for Petersfield. The coal received at Portsmouth was delivered between, Godalming, Liss, which took 163 tons, Petersfield, which received 231 tons, Rigate taking 139 tons, and a few small places on the line.

Of the coal received at Basingstoke, the largest quantities were delivered at the following stations:—

	Tons.
Guildford, Surrey	1,322
Godalming, do.	1,216
Havant, Hants	286
Portsmouth, do.	485
Farnham, do.	278
Alton, do.	498
Alresford do.	307
Winchfield, do.	1,397
Mickeldever do.	679
Winchester do.	854
Southampton do.	4,649
Bishop's Waltham do.	3,471
Oakley do.	608
Whitchurch do.	696
Honiton, Devon	217
Exeter do.	347

Of the 42,602 tons received at Southampton, the largest quantities were received at the following stations:—

	Tons.
Liss, Hants	853
Farnham, do.	533
Alresford, do.	1,580
Itchen Abbas, do.	285

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		Tons.
Basingstoke,	Hants	1,054
Winchester,	do.	14,765
Netley,	do.	1,875
Bishop's Waltham,	do.	837
Romsey,	do.	3,289
Christchurch,	do.	682
Andover,	do.	2,266
Horsebridge,	do.	1,267
Salisbury,	Wilts	4,183

The coal received at Redbridge and Eling was delivered at Romsey, Dunbridge, Fordingbridge, Ringwood, Andover, Fullerton, Salisbury, which city took 4,484 tons, Wilton, and a few smaller places.

From Wimborne in Dorset 19,460 tons were taken. The largest quantities were left at the following stations:—

	Tons.
Godalming, Surrey	59
Liphook, Hants	113
Petersfield, Hants	588
Rogate, Sussex	187
Havant, Hants	917
Farnham, Surrey	387
Bentley, Hants	209
Alton, Hants	960
Alresford, Hants	351
Winchester, Hants	794
Southampton, Hants	362
Bishops Waltham, Hants	355
Gosport, Hants	1,590
Verwood, Dorset	258
Ringwood, Hants	399
Christchurch, Hants	462
Poole Junction, Dorset	599
Poole, Dorset	5,479
Wareham, Dorset	376
Wool, Dorset	209
Dorchester, Dorset	1,743

From Poole 291 tons were taken to Verwood, and 1,176 tons to Ringwood, and 788 tons to Wimborne, the remainder being distributed along the line in small quantities. The small quantity received at Dorchester was distributed between Poole and Weymouth.

Of the coal received at Weymouth, Dorchester had 2,059 tons; the remainder was left at three other stations.

Salisbury received 27,709 tons. The chief distribution was—

	Tons.
Winchester, Hants	1,171
Southampton, Hants	4,137
Romsey, Hants	997
Downton	1,385
Fordingbridge, Hants	1,391
Andover, Hants	3,016
Dinton, Wilts	1,006
Tisbury, Wilts	2,734
Semley, Wilts	7,459
Gillingham, Dorset	1,781

The largest quantities of the coal received at Templecombe were distributed as follows:—

	Tons.
Whitchurch, Hants	285
Andover Town, Hants	505
Grateley, Hants	444
Salisbury, Hants	847
Semley, Wilts	257
Gillingham, Dorset	888
Milborne Park, Somerset	398
Sherborne, Dorset	2,838
Yeovil, Somerset	1,297
Crewkerne, Somerset	4,371
Chard, Somerset	4,337
Axminster, Devon	2,130
Colyton, Devon	803
Honiton, Devon	2,262
Ottery Road, Devon	831

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The coal received at Yeovil was distributed between fourteen stations, the principal receivers being—

	Tons.
Gillingham, Dorset	2,535
Milborne Porke, Somerset	1,432
Sherborne, Dorset	5,649
Crewkerne, Somerset	5,965
Chard, Somerset	805
Honiton, Devon	191
Ottery Road, Devon	255

From Exeter 2,465 tons were distributed between 16 stations, Ottery Road taking 481 tons, Broad Clyst 523 tons, Oakhampton 138. Small quantities were delivered at South Molton Road and adjoining stations.

From Fremington near Barnstable, at which station 43,449 tons were received from Wales, the coal was distributed as follows:—

	Tons.
Chard Town, Somerset	25
Axminster, Devon	731
Colyton Town and Junction, Devon	110
Seaton, Devon	96
Honiton, Devon	928
Ottery Road, Devon	887
Whimple, Devon	249
Broad Clyst, Devon	319
Exeter and St. David's, Devon	11,836
St. Cyres, Devon	172
Crediton, Devon	15,177
Yeoford, Devon	715
Bow, Devon	351
North Tawton, Devon	2,716
Okehampton, Devon	2,101
Copplestone, Devon	330
Morchard Road, Devon	918
Lapford, Devon	515
Eggesford, Devon	976
South Molton Road, Devon	2,111
Portsmouth Arms	246
Umberleigh, Devon	1,099
Barnstable, Devon	5
Bideford, Devon	51
Topsam, Devon	111
Woodbury Road, Devon	87
Lympstone, Devon	29
Exmouth, Devon	558

Topsam received 2,627 tons, and Exmouth 1,412, which were distributed by this railway over 13 stations.

	Tons.
Axminster, Devon	297
Honiton, Devon	178
Ottery Road, Devon	955
Exeter, Devon	289
Crediton, Devon	1,081

The London, Chatham, and Dover Railway.

London, Chatham, and Dover Railway.

Return showing the quantity of coal received from seaports, rivers, and canals, and its distribution, during the year ending December 31st, 1868.

Stations.	Received at Stewart's Lane,* and sent to	Received at Faversham, and sent to	Received at Queenboro', and sent to	Total.
	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
Stewart's Lane	478 1	—	—	478 1
Beckenham	—	—	30 6	30 6
Bickley	—	—	20 17	20 17
St. Mary Cray	—	—	68 15	68 15
Shoreham	—	—	147 19	147 19
Sevenoaks	14 5	14 7	531 11	560 3
Farningham	—	6 0	87 19	93 19
Meopham	13 9	—	217 16	231 5
Sole Street	—	—	210 2	210 2

* Battersea Wharf.

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London, Chatham, and Dover Railway.

Stations.	Received at Stewart's Lane,* and sent to	Received at Faversham, and sent to	Received at Queenboro' and sent to	Total.
	Tons. cwt.	Tons. cwt.	Tons. cwt.	Tons. cwt.
Chatham	—	—	14 18	14 18
New Brompton	12 19	—	—	12 19
Rainham	—	—	22 16	22 16
Newington	—	6 0	49 17	55 17
Sittingbourne	—	—	74 15	74 15
Sheerness	—	—	7 8	7 8
Teynham	—	17 0	45 5	62 5
Faversham	—	—	60 14	60 14
Whitstable	—	—	6 7	6 7
Herne Bay	—	37 0	228 6	265 6
Birchington	—	—	679 3	679 3
Broadstairs	—	8 0	371 11	379 11
Selling	—	76 15	78 11	155 6
Canterbury	—	309 5	8,980 6	9,289 11
Bekesbourne	—	165 10	917 13	1,083 3
Adisham	—	79 5	134 10	213 15
Shepherd's Well	—	—	404 18	404 18
Ewell	—	—	41 17	41 17
Longfield Siding	—	—	14 10	14 10
Total	518 14	719 2	13,448 10	14,686 6

* Battersea Wharf.

South Eastern Railway.

South-eastern Railway.

Return of Coals received at the under-mentioned Ports and Wharves, and conveyed to Stations on the South-eastern Railway, for the Year ending January 31st, 1869.

	Tons.
Angerstein Wharf	13,433
Erith	37,690
Strood	42,632
Rye	9,396
Whitstable	66,308
Total	169,459

Brighton Railway.

The Brighton Railway.

Return of Coal Traffic conveyed by the Brighton Railway from the various Wharves on their System, for Year ending 31st December 1869.

	Tons.
Public Traffic	197,573
Company's	9,108
Tons	206,681

For the London, Brighton, and South Coast.

From the Breconshire coalfield Norwood receives seven tons.

Great Eastern Railway.

Great Eastern Railway.

Return of Coal Traffic landed at the Ports of the Great Eastern Railway, and invoiced thence to Great Eastern Stations, for the 12 months ending December 31st, 1868.

	Tons.
Blackwall	27,151
Maldon	8,022
Hythe and Wivenhoe	19,643
Mistley	2,242
Ipswich	26,537
Yarmouth	877
Lowestoft	17,877
Wisbeach	402
Lynn	38,679
Wells	7,309
Total	148,739

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GENERAL SUMMARY of the Quantities of Coal brought into the London District, Coastwise, by Inland Navigation, and Railways, from the Returns published by the Authority of the Corporation of the City of London.*

London coal received since 1834.

					Tons.
1834	Coastwise and Inland Navigation				2,080,547
1835	Do.		Do.		2,299,816
1836	Do.		Do.		2,399,551
1837	Do.	2,626,997	Do.	2,324	2,629,321
1838	Do.	2,581,085	Do.	1,685	2,582,770
1839	Do.	2,625,323	Do.	12,933	2,638,256
1840	Do.	2,566,899	Do.	22,188	2,589,087
1841	Do.	2,909,144	Do.	33,594	2,942,738
1842	Do.	2,723,200	Do.	31,519	2,754,719
1843	Do.	2,628,520	Do.	34,684	2,663,204
1844	Do.	2,490,910	Do.	72,256	2,563,166
			Railway and		
1845	Do.	3,392,512	Canal.	86,687	3,461,199
1846	Do.	2,920,367	Do.	33,629	2,953,996
1847	Do.	3,280,420	Do.	41,967	3,322,387
1848	Do.	3,418,340	Do.	60,849	3,479,189
1849	Do.	3,339,146	Do.	41,640	3,380,786
1850	Do.	3,553,304	Do.	85,579	3,638,883
1851	Do.	3,236,542	Do.	254,421	3,490,963
1852	Do.	3,330,428	Do.	414,917	3,745,345
1853	Do.	3,373,256	Do.	653,729	4,026,985
1854†	Do.	3,399,561	Do.	977,210	4,376,771
1855	Do.	3,016,869	Do.	1,161,086	4,177,955
1856	Do.	3,119,884	Do.	1,271,700	4,391,584
1857	Do.	3,133,459	Do.	1,233,172	4,366,631
1858	Do.	3,266,446	Do.	1,210,645	4,477,091
1859	Do.	3,299,170	Do.	1,208,132	4,507,302
1860	Do.	3,573,377	Do.	1,497,138	5,070,515
1861	Do.	3,567,002	Do.	1,661,083	5,228,085
1862	Do.	3,442,402	Do.	1,524,947	4,967,349
1863	Do.	3,335,174	Do.	1,784,713	5,119,887
1864	Do.	3,116,703	Do.	2,351,342	5,668,045
1865	Do.	3,161,683	Do.	2,741,588	5,903,271
1866	Do.	3,033,193	Do.	2,980,072	6,013,265
1867	Do.	3,016,416	Do.	3,395,617	6,322,033
1868	Do.	2,981,230	Do.	2,988,860	5,970,090
1869	Do.	2,873,688	Do.	3,348,527	6,220,215

* See also a statement of the seaborne coal trade from Paddington and Brentford, short of, and to and beyond Lady Capel's, from 1829 to 1837. (Appendix Table 57 B.), p. 79.

† For detailed account of coal and coke brought into London since 1854 see Appendix, Table No. 125, p. 112.

‡ The return from 1861 to 1866 is collated with a return moved for by Mr. Alderman Salomons in the House of Commons.

For a detailed return for 1870 see Appendix, No. 124, p. 106.

SUMMARY OF RAILWAY DISTRIBUTION.

TOTAL QUANTITIES of COAL carried from each COAL-PRODUCING DISTRICT by the different Lines of Railway.

Railways.	Districts.	In 1866.	In 1867.	In 1868.	In 1869.
		Tons.	Tons.	Tons.	Tons.
Great Northern	Durham	—	—	—	509,164
	South Yorkshire	—	—	—	470,140
	West Riding	—	—	—	425,578
	Derbyshire	—	—	—	558,735
	Leicestershire	—	—	—	6,321
	Retford	—	—	—	151,603
	Total	—	—	—	2,121,541
London and North-western	Anglesea	—	56	—	—
	Carnarvon	—	174	—	—
	Breconshire	—	27,868	30,345	71,415
	Derbyshire	—	52,343	53,824	42,129
	Cheshire	—	66,729	148,236	123,896
	Cumberland	—	429,467	389,487	529,223
	Flintshire	—	372,699	381,668	321,369
	Lancashire	—	4,032,446	3,741,975	4,211,080
	Monmouthshire	—	29,638	17,303	—
	Shropshire	—	45,936	59,186	117,797
	Staffordshire	—	455,129	445,967	654,916
	Warwickshire	—	211,144	183,346	183,886
	Yorkshire	—	183,374	196,732	232,496
	Total	—	5,887,003	5,658,069	6,488,207

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RAILWAYS.

Railways.	Districts.	In 1866.	In 1867.	In 1868.	In 1869.
		Tons.	Tons.	Tons.	Tons.
Midland	Derbyshire	3,135,855	3,555,745	3,350,393	3,617,082
	Yorkshire	968,600	1,028,353	1,136,539	1,246,022
	Leicestershire	865,240	920,476	777,603	864,273
	Gloucestershire	230,748	226,643	210,138	215,718
	Durham	82,641	83,258	67,968	85,652
	Nottinghamshire	197,873	80,506	173,151	383,548
	Warwickshire	74,751	60,134	60,093	62,903
	Staffordshire	33,376	43,263	34,667	41,189
	Lancashire	14,740	10,247	11,369	15,744
	South Wales	986	1,637	573	390
	Total	5,604,810	6,010,262	5,822,494	6,532,521
North-eastern	Durham and Northumberland	—	—	—	8,280,310
	Yorkshire and Lancashire	—	—	—	675,378
	Total	—	—	—	8,955,688
Great Western	North Wales	—	—	703,379	2,800,790
	South Wales	—	—	2,332,656	611,524
	South Staffordshire	—	—	290,720	—
	Radstock	—	—	222,948	271,326
	Total	—	—	3,549,703	3,683,640
Manchester, Sheffield, and Lincolnshire	Yorkshire and Derbyshire and Lancashire	—	—	690,549	773,572
	South Yorkshire	—	—	1,498,456	1,322,788
	Total	—	—	2,189,005	2,096,350
North Staffordshire		—	577,183	586,393	546,130
Furness	Whitehaven	—	—	—	33,829
	Wigan	—	—	—	122,687
	Midland	—	—	—	46,728
	Stockton and Darlington	—	—	—	1,947
	Cleator Moor	—	—	—	4
	Total	—	—	—	205,195
Caledonian	Lanarkshire	—	—	—	3,869,491
	Edinburghshire	—	—	—	100,251
	Stirlingshire	—	—	—	16,260
	Renfrewshire	—	—	—	10,207
	Total	—	—	—	4,023,209
North British	Fife	—	—	—	880,241
	Lothians	—	—	—	388,398
	West	—	—	—	2,455,087
	Border	—	—	—	183,388
	Total	—	—	—	3,907,064
Glasgow and South Western		—	—	—	1,690,207
Lancashire and Yorkshire	Lancashire	—	—	—	2,261,511
	Yorkshire	—	—	—	1,023,261
	Total	—	—	—	3,284,772
Cambrian	Oswestry	—	—	—	10,935

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RAILWAYS.

Railways.	Districts.	In 1866.	In 1867.	In 1868.	In 1869.
		Tons.	Tons.	Tons.	Tons.
Llanelly		—	—	—	510,781
Monmouthshire		—	—	1,389,660	1,528,354
Swansea Valley		—	—	390,183	398,096
South Wales Mineral		—	—	107,709	—
Mid Wales		—	30,659	—	—
Vale of Neath		—	—	1,046,432	1,186,064

COAL AND PATENT FUEL RECEIVED COASTWISE.

Coastwise distribution of coal.

COAK and PATENT FUEL received COASTWISE at the various PORTS of ENGLAND, SCOTLAND, and IRELAND, in each of the years 1868 and 1869.

ENGLAND.

Ports at which received.	Coals.		Patent Fuel.	
	1868.	1869.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
London	2,981,230	2,873,688	14,555	14,679
Rochester	411,530	430,420	—	2,907
Faversham	132,835	135,385	—	—
Ramsgate	21,849	24,357	—	—
Deal	15,210	15,798	—	—
Dover	55,557	57,894	—	—
Folkestone	50,546	51,915	—	—
Rye	51,628	49,299	—	—
Newhaven	84,062	83,939	—	—
Shoreham	117,115	109,564	—	—
Littlehampton	55,059	54,188	—	—
Portsmouth	193,212	193,401	—	—
Southampton	225,900	255,172	230	—
Cowes	60,417	63,871	—	—
Poole	45,194	48,338	—	—
Weymouth	26,914	33,497	—	1,688
Bridport	5,241	4,440	—	—
Lyme	5,652	5,079	—	—
Exeter	53,758	60,145	—	—
Teignmouth	53,205	54,363	—	—
Dartmouth	43,940	43,799	—	—
Plymouth	242,275	280,416	394	840
Fowey	61,369	72,001	—	—
Falmouth	36,715	45,407	635	—
Truro	75,661	89,715	—	—
Hayle	162,194	197,191	—	—
Penzance	50,448	60,004	—	—
Scilly	1,677	2,598	—	—
Padstow	36,156	44,044	—	—
Bideford	29,657	33,342	—	—
Barnstaple	70,495	74,552	—	—
Bridgewater	231,192	239,714	—	—
Bristol	240,616	245,001	—	—
Gloucester	18,688	20,955	—	—
Chepstow	8,766	9,047	—	—
Swansea	369	1,412	—	—
Llanelly	4,261	1,903	—	—
Milford	17,762	14,850	—	—
Cardigan	2,585	5,924	—	—
Aberystwith	14,098	11,995	—	—
Carnarvon	77,391	57,625	—	—
Beaumaris	42,635	43,456	—	—
Douglas	33,000	38,413	—	—
Castletown	11,340	11,992	—	—

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Coastwise distribution.

Ports at which received.	Coals.		Patent Fuel.	
	1868.	1869.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
Ramsay	9,456	10,175	232	—
Liverpoool	159,240	129,895	5,417	7,369
Lancaster	26,062	24,433	—	—
Workington	1,296	300	—	—
Berwick	6,876	7,658	—	—
Newcastle	70	—	—	—
Stockton	2,437	2,402	—	—
Middlesborough	—	50	—	—
Whitby	16,818	17,492	—	—
Scarborough	20,069	20,303	—	—
Gainsborough	—	895	—	—
Hull	4,811	5,322	—	—
Grimsby	3,349	4,553	—	—
Boston	23,035	23,766	—	—
Wisbeach	10,762	8,118	—	—
Lynn	83,250	70,226	—	—
Wells	21,900	20,494	—	40
Yarmouth	115,928	101,136	—	—
Lowestoft	92,039	90,754	—	—
Woodbridge	18,199	15,588	—	162
Ipswich	62,205	55,408	—	—
Harwich	28,919	25,075	—	—
Maldon	61,255	61,269	—	—
Colchester	43,800	36,535	—	—
Total	6,971,180	6,981,956	21,463	27,685

SCOTLAND.

—	Coals.		Patent Fuel.	
	1868.	1869.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
Leith	57,775	63,971	—	—
Granton	170	—	—	—
Grangemouth	3,151	3,262	—	—
Alloa	133	159	—	—
Kirkcaldy	5,691	5,251	—	—
Dundee	193,906	199,261	—	—
Perth	4,930	4,891	—	—
Montrose	58,734	57,590	—	—
Arbroath	40,672	41,039	—	—
Aberdeen	195,372	202,925	—	6
Peterhead	21,515	13,304	—	—
Banff	29,138	25,932	—	—
Inverness	86,922	84,591	—	—
Wick	15,367	16,308	7	15
Kirkwall	8,282	8,735	—	—
Lerwick	2,536	3,341	—	—
Stornoway	1,470	1,374	—	—
Greenock	12,928	11,122	—	—
Port Glasgow	270	—	—	—
Glasgow	2,206	1,301	443	806
Ardrossan	1,140	1,243	—	—
Troon	183	193	—	—
Ayr	110	106	—	—
Campbeltown	22,672	25,213	—	—
Dumfries	11,488	9,633	—	—
Wigtown	13,916	14,314	—	—
Stranraer	16,042	18,422	—	—
Total	806,719	813,481	450	827

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IRELAND.

Coastwise distribution.

Ports at which received.	Coals.		Patent Fuel.	
	1868.	1869.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
Dublin	659,006	725,591	—	—
Wexford	37,087	49,407	—	—
Waterford	117,428	140,648	—	—
New Ross	25,964	26,902	—	—
Cork	253,736	286,899	—	—
Youghal	24,998	34,079	—	—
Skibbereen	10,023	11,801	—	—
Limerick	39,340	48,773	—	—
Tralee	6,663	4,377	—	—
Galway	10,782	11,616	—	—
Westport	2,226	2,244	—	—
Sligo	11,675	11,326	—	—
Ballina	1,622	1,738	—	—
Londonderry	80,465	82,543	—	—
Coleraine	20,080	18,615	—	—
Belfast	694,927	710,065	—	—
Newry	111,476	102,161	1,170	—
Dundalk	67,235	75,828	—	—
Drogheda	42,166	53,928	—	—
Total	2,216,899	2,398,541	1,170	—

SUMMARY.

Ports at which received.	Coals.		Patent Fuel.	
	1868.	1869.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.
England	6,971,180	6,981,956	21,463	27,685
Scotland	806,719	813,481	450	827
Ireland	2,216,899	2,398,541	1,170	—
Total	9,994,798	10,193,978	23,083	28,512

CANNEL COAL AND BITUMINOUS SHALES.

Cannel Coal and Shales.

It is important to give, as a section of this chapter, some general notice of the cannel coal and bituminous shales.

The following returns must not be regarded as quite complete. They may, however, be received as perfectly correct, as far as it has been possible to carry the inquiry.

It should be explained that the quantities of cannel coal raised and used have been included in the general statement of our coal produce already given.

Detailed Statement of the Production of Cannel Coal in Great Britain.

ENGLAND.

Staffordshire, North.—A cannel coal of uncertain quality occurs in this district, especially between Hanley and Harecastle. It is usually termed in the locality "pill" or "peal," and is sold at the pit's mouth at 10*s.* the ton. The quantity of this cannel which is raised annually is about - - - - - - - - - 10,000 tons.

Nottinghamshire.—The chief if not the only place in this county at which cannel is worked is at Hucknall Torkard near Nottingham. All that is raised is appropriated for oil making, the quantity produced being - - - - - - - - - 46,950 „

Derbyshire.—The places producing this variety of coal are the following:—

Renshaw, near Chesterfield.—This is not strictly a cannel.

Swanwick Colliery.—This is a cannel of fair average quality.

Clay Cross.—But little is worked on this estate at present.

The total production of Derbyshire - - - - - 42,225 tons.

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YORKSHIRE.—The Mines in Yorkshire producing cannel are—

1. Silkstone Fall, Barnsley.
2. Adwalton Moor, Leeds.
3. Bruntcliffe, Leeds.
4. Gildersome, Leeds.
5. College, Birstal.
6. Oakwell, Leeds.
7. Ardsley Main, Ardsley.

Some of this is an inferior cannel, known, locally, as "drub" or "stub," and a considerable quantity of the true cannel of the West Riding will not coke. The quantity raised annually from the Yorkshire district is about - - - - - - - - 185,000 „

LANCASHIRE.—The collieries in the East Lancashire (Manchester) district producing cannel coal are the following:—

1. Bank, Little Hulton.
2. Blackrod, Chorley.
3. Blackrod, Blackrod.
4. Bridgewater, Worsley.
5. Hulton, Bolton.
6. Scot Lane, Blackrod.
7. Stonehill, Farnworth.
8. Rigby Pit, Anderton Hall.

The total estimated production being - - - - 120,000 „

The collieries in the West Lancashire (Wigan) district producing Cannel are—

1. Haigh, Haigh and Aspull.
2. Aspull, Haigh and Aspull.
3. Kirkless Hall, Kirkless.
4. Standish, Standish.

(These belong to the Wigan Coal and Iron Company)

5. Rose Bridge, Ince.
6. Douglas Bank, Wigan.
7. Norley Hall, Pemberton.
8. Ince Hall, Wigan.
9. Walthew House, Pemberton.
10. Gidlow Lane, Wigan.
11. Rowenhead, St. Helen's.

The total production of these collieries was - - - - 530,000 „

CHESHIRE.—Duckinfield, Stockport, is the only colliery in this county producing cannel coal. The present yield being - - 12,000 „

The AVERAGE PRODUCTION of CANNEL COAL in ENGLAND from the Year 1865 to 1869.

	Tons.
North Staffordshire - - - -	10,000
Nottinghamshire - - - -	46,950
Derbyshire - - - - -	42,225
Yorkshire - - - - -	185,000
Lancashire - - - - -	650,000
Cheshire - - - - -	12,000
The total present production in England -	946,175

At least 50,000 tons of this, possibly much more, was at one time reserved for the manufacture of the coal and shale oils; but the low price of the coal oils sent from America has destroyed a considerable section of this trade. Nearly all the cannel coal now raised is used in the manufacture of gas.

WALES.

NORTH WALES.—This is the only district at present producing cannel. The collieries yielding it are—

1. Leeswood Green, Mold.
2. Leeswood Hill, Mold.
3. Coed Talon, Mold.
4. Coppa, Mold.
5. Nerquis, Mold.
6 Wern, Bagilt.

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From these works the quantity of cannel coal raised was as nearly as can be ascertained 150,000 tons in 1865, almost the whole of which was then consumed in the extensive oil works of Flintshire, which are now suspended. As in other places, the cannel which is now worked is used at the gas works.

SCOTLAND.

It is fortunate that we have reliable information as to the output of cannel coal from this important field.

At a meeting of coal owners, recently held in Glasgow, the estimated average quantity raised annually from 1865 to 1869 was given as follows :—

	Tons.
Lanarkshire	172,000
Linlithgowshire	28,000
East and Mid-Lothian	55,000
Fifeshire	29,000
Ayrshire	38,000
Giving as the total quantity	322,000

The stock of cannel coal on hand was then stated to be 61,500 tons, making the total quantity raised as 383,500 tons. Mr. Binney informs us that nearly 100,000 tons of this is used in making oil and paraffine in the works between Glasgow and Edinburgh.

The total Quantity of CANNEL COAL produced in the UNITED KINGDOM may be thus estimated :—

	Tons.
England	946,175
Wales	150,000
Scotland	322,000
	1,418,176
At a low estimate 250,000 tons of this has been submitted to distillation for coal-oil; therefore, for gas-making and other purposes, the total quantity obtained will be	1,168,176

LISTS OF CANNEL AND SHALE OIL WORKS IN GREAT BRITAIN,

Distilling crude Petroleum from Cannel coal or Bituminous Shales or Sandstones, so far as these have been ascertained, were in 1865 as follows. Many of these are now idle :—

FLINTSHIRE.

Proprietors.	Locality.
Flintshire Oil and Cannel Coal Company, Limited	Saltney.
British Oil and Cannel Company	Leeswood.
Canneline Oil Company	Coed Talon.
Coppa Oil Company	Padeswood.
William's Patent Mineral Charcoal and Oil Company	Ponty Bodkin.
W. B. Marston's Oil Works	Coed Talon.
Leeswood Main Cannel Oil Company	Hope and Leeswood.
North Wales Oil Company	Lower Leeswood.
Padeswood Oil Company	Padeswood.
Roger Jones and Company	Hope.
E. G. Buttery and Company	Hope.
Thomas Green	Padeswood.
G. H. Birkbeck and Company	Padeswood.
Ness and Griffiths	Padeswood.
Barlow and Jeff's	Coed Talon.
F. Page and Company	Padeswood.
Mold Mineral Oil Company	Mold.
G. F. Milthorp	Padeswood.
Glover and Company	Leeswood.
Hardman and Sharett	Tryddu.
Plasy Mhowys Oil Company	Nerquis.
The Cambrian Oil Company	Hope.

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The Plaskynaston Colliery Company had just then completed a large contract for cannel coal, with a London Gas Company, at 12*s.* the ton. At Trydyn, where there are about 50 or 60 acres of cannel, it has been proved to be from 5 to 9 inches only in thickness, and it is all of the "smooth" cannel, no "curly." It will be understood that the latter variety is greatly superior to the former.

Sections of cannel coal.

Leeswood has about 120 acres four feet thick on the average. The section being—

	Yds.	Ft.	In.
Black Shale	3	2	8
Light Shale	0	0	7
Black Slag	0	0	7
Top Cannel, Smooth	0	2	2
Middle Cannel, Curly	0	1	8
Lower Cannel, Bastard	0	1	5
Black Shale	0	3	0

At the Mold Cannel Works, the Broncoed Colliery, and Bromfield Colliery, the section is—

	Ft.	In.
Soft Metal	1	0
Smooth Cannel	0	9
Inferior coal	1	8
Soft Floor	0	0

The North Wales Oil Works have—

Smooth Cannel	3	0
Curly ditto	1	8
Shale	2	0

And here the cannel coal seam has doubled upon itself, by a succession of movements, attaining in some places a considerable thickness.

At Coed Talon they have also about four feet of cannel.

	Yds.	Ft.	In.
Shale	5	0	0
Coal	0	2	0
Fire-clay	4	2	0
Black Shale	10	2	0
Cannel Coal	1	1	0
Bottom Shale		—	

At a depth of 224 yds. 1 ft. 10 in. They probably have about from 200 to 250 acres remaining.

A little cannel has been worked at Mostyn, on the banks of the Dee, and at Wern Colliery near Bagilt they are now producing a small quantity. A thin bed of cannel, about six inches thick, can be traced from Bagilt to Mostyn.

The bituminous shales yield 33 gals. of crude oil to the ton.

Smooth cannel	„ 36	„	„
Curly cannel	„ 75	„	„
Bagilt cannel	„ 35	„	„

The percentage of produce from the crude oil,—

Spirits	4·95
Burning oil	21·60
Lubricating oil	8·84
Liquid grease	4·58
Stiff grease	37·55
Loss	22·48
	100·000

North Staffordshire.

Proprietors.	Locality.	No. of Retorts.
Messrs. Adams	Tunstall	20
H. Meir, Esq.	Do.	20
Messrs. May and Co.	Burslem	40
Messrs. Glover	Longton	10
Messrs. Slater and Co.	Burslem	36
Messrs. Wards and Co.	Hanley	18
Messrs. Hardman and Co.	Milton	8
North Staffordshire Coal and Iron Company	Tunstall	2
		154

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Each retort yields on an average 30 gallons of crude oil per day of 24 hours, working 6 days per week, say 100 tons of crude oil per week for the district. Of the BITUMINOUS SHALES they are now raising nearly 10,000 tons per annum, selling at the pit's mouth for 12*s.* the ton.

YORKSHIRE.—West Ardsley Coal Company. These retorts are but just going into work for the distillation of shale.

SHROPSHIRE.—Bituminous shales are being worked, but at yet the rate of production is not high.

SCOTLAND.

LANARKSHIRE.—In the western division of this county there are five collieries working "gas coal," as cannel is called in Scotland, of the "splint seam," and two others are working cannel coal with the ironstone. In the eastern division twenty collieries are working the cannel of the "splint seam," four the Killongue "mussel band," six the Killongue, and 11 the Lesmahago coal. Scotch cannel coal.

FIFESHIRE.—There are six or seven collieries working the "Lesmahago," and four or five the "Boghead coal."

HADDINGTONSHIRE.—There are four collieries yielding "gas coal."

KINROSSHIRE.—Yields "gas coal" from one.

EDINBURGHSHIRE.—Has four collieries producing "Lesmahago," and five the cannel of the "splint coal."

LINLITHGOWSHIRE.—Has four collieries yielding "Boghead," and two or three "Lesmahago."

STIRLINGSHIRE.—Has one colliery producing the Killongue mussel."

PERTHSHIRE.—Has two collieries giving "Lesmahago" cannel.

The present rate of production from these collieries has been already given.

It may be useful to state the oil-producing power of some of these coals.

Boghead	-	produces	128	gallons of oil per ton.
Methel	-	,,	90	,, ,,
Capeldræ	-	,,	81	,, ,,
Lesmahago	-	,,	78	,, ,,
Rochsoles	-	,,	72	,, ,,

The "Boghead" variety of coal, with its present price, 74*s.* the ton, is placed beyond the reach of the gas manufacturers. Of it Mr. Binney, our highest authority, writes—

"The Boghead coal occurs in the higher part of the Scotch coalfield in about the position of the "slaty band" of ironstone; its range is not more than three or four miles, in the lands of Torbane, Inchcross, Boghead, Sappers, and Bathvale, near Bathgate, in the county of Linlithgow. In thickness it varies from 1 to 30 inches, and at the present consumption, say from 80,000 to 100,000 tons per annum, it cannot last many years."

Bituminous shales are also worked in many localities, and the works for the distillation of cannel coal and shales are extending.

PEAT.

The use of peat for gas manufacture having attracted some attention, it was thought desirable to obtain some information as to its use in the prisons of Dartmoor, where it has been used for this purpose for some time. The following information is to the point:—

In answer to queries received from the Coal Commission Committee, dated January 6th, 1869, I beg to state the following:—

1st. 706 tons peat was cut during the year 1868.

Tons	cwts.	lbs.	
2nd. 362	13	0	peat was used for making gas during the same year, namely,
193	11	0	for gas.
169	2	0	as fuel for heating retorts.
362	13	0	

3rd. The illuminating power of the gas made depends entirely on the quality of the peat. One ton of *good black peat* will produce about 8,000 cubic feet of gas, equal in brilliancy to that made from coal. As the peat varies in quality, and our bogs being nearly exhausted, we use a portion of coal with the peat varying from 20 to 30 per cent.

4th. The quantity of coke made and its use.—One ton of peat yields about 25 per cent. coke or charcoal, the greater portion of which is used as a manure, after being charged with ammonical liquor, sea water, or night soil.

5th. The value of the ashes, &c. One ton of peat yields about 12½ per. cent. ashes, which is mixed and used with the coke, and valued here at 30*s.* per ton.

The use of peat in Wales and in Ireland, and in many parts of the kingdom, as the fuel for the peasantry, need scarcely be referred to; but the quantity used is very large, and to the extent of its use substitutes coal.

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CHAPTER VI.

THE EXPORTATION OF COAL TO FOREIGN COUNTRIES.

It has been already shown that in the early part of the sixteenth century there was a foreign trade in Newcastle coal, especially with France, and that it was so sufficiently important as to induce men to urge upon the Government the advantages to be derived from cultivating the export trade to a greater extent. In the reign of Edward the 6th we learn that most of the coal carried to France from the Tyne was taken by fishing boats. "As soone as theyr fishing is done," they appear to have taken in coals, which Mr. Thomas Barnabe tells us he bought "at Newcastle for two shillings and twopence a "chaldron, and for thirteen nobles sold them again in France." As early as 1563 we are told of "the "great multitude of coal carried furth of this realme as common ballaste for emptie ships," but we have no account of the quantity.

A foreign trade in coal appears to have been very assiduously cultivated in the 18th century; the restrictions enforced by the committee of coalowners did not apply to coal shipped to foreign ports; and we are told that coal was frequently sold in foreign markets at 40 per cent. under the prices in the London market. It is not possible, until the end of the last century, to separate the coals shipped for other ports in the kingdom. The first accurate return of coals shipped from the ports of Newcastle, Sunderland, Hartley, and Blythe for foreign countries is in 1791, when the shipments were as follows:—

	Tons.	Cwt.	Foreign Shipments, including Ireland, from Ports north of the Humber, give the following Returns, according to Accounts and Papers. House of Commons Library. Tons.
Appendix, Table No. 8, p. 4. 1791	264,944	7	—
1792	255,832	6	—
1793	223,175	1	—
1794	210,606	2	—
1795	122,626	2	167,131
1796	131,475	15	186,361
1797	118,231	2	162,164
1798	132,498	14	188,487
1799	125,959	16	171,941*

The foreign shipments in the ten years included amounted to 1,585,349 tons, or an average of about 150,000 tons from the Newcastle coalfield a year. Commencing with 1790, we have also the following shipments from Swansea and other Welsh ports:—

Appendix, Tables Nos. 13 and 14, p. 6.

——	Swansea.	Other Welsh Ports.	Total.
	Tons.	Tons.	Tons.
1790	29,259	3,704	32,963
1791	33,978	2,700	36,678
1792	35,053	1,765	36,818
1793	40,880	2,264	43,144
1794	33,297	1,104	34,401
1795	28,929	637	29,566
1796	34,351	774	35,125
1797	29,897	1,750	31,647
1798	28,372	1,846	30,218
1799	28,231	1,316	29,547

From the ports of Scotland during the same period the total shipments of coals to foreign countries were:—

	Tons.	Cwt.
Appendix No. 11, 12, p. 5. 1790–1791	33,416	15
1791–1792	36,679	2
1792–1793	29,752	17
1793–1794	20,062	12
1794–1795	30,502	14
1795–1796	20,107	15
1796–1797	31,115	4
1797–1798	19,431	3
1798–1799	24,849	3
1799–1800	11,838	9

* Probably the excess in these quantities represent the coal sent from Cumberland to Ireland.

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The total shipments from the ports included in the above, which will represent nearly the total shipments from this country to foreign countries will have been in—

	Tons.		
1791	335,038		
1795	172,299	+	44,505 ?*
1799	183,357	+	45,982 ?*

It is evident, therefore, that towards the end of the last century there was a considerable falling off in our exports of coal. This was, no doubt, owing to the very disturbed state of affairs on the continent at this time.

From 1800 we have more exact returns of our foreign coal trade, for the details of which we must refer to the Appendix. In the ten years ending 1810 we shipped from— Appendix, Table No. 23, p. 55.

	Tons.
Newcastle to foreign ports	963,098
And from Sunderland	180,929
Total shipments	1,144,027

In the ten years ending 1820,—

Newcastle sent to foreign ports	953,963
Sunderland ditto	286,111
Total shipments	1,240,074

Or an increase over the previous ten years of 96,047 tons.

In the ten years ending 1830,—

Newcastle sent to foreign ports	1,520,642
Sunderland ditto	471,858
Total shipments	1,992,500

Or an increase over the previous ten years of 752.426 tons.

In the ten years ending 1840,—

Newcastle sent to foreign ports	3,733,886
Sunderland ditto	2,320,086
Stockton shipped ditto	455,234
Total shipments	6,509,206

Or an increase over the previous ten years of 4,516,706 tons.

In the ten years ending 1850,—

Newcastle shipped to foreign ports	9,094,956
Sunderland ditto	4,099,724
Stockton ditto	1,522,433
Hartlepool, for 6 years, ditto	1,357,804
North Shields, for 3 years, ditto	536,717
Total shipments	16,611,634

Or an increase over the previous ten years of 10,102,428 tons.

Total Aggregate Shipments from the Northern Ports from 1801 to 1850, exhibiting total Increase, have been as follows:

—	Newcastle.	Sunderland.	Stockton.	Hartlepool.	North Shields.	Total from Northern Ports.	Total Increase on previous 10 Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
From 1801 to 1810, both inclusive	15,488,784	8,370,644	—	—	—	23,859,428	—
From 1811 to 1820, both inclusive	18,227,100	10,020,639	—	—	—	28,247,739	4,388,311
From 1821 to 1830, both inclusive	20,649,788	13,527,941	110,211	—	—	34,287,940	6,040,201
From 1831 to 1840, both inclusive	25,429,476	12,164,794	8,293,984	—	—	45,888,254	11,600,314
From 1841 to 1850, both inclusive	32,185,304	18,340,200	11,019,714	6,581,039	1,249,143	69,375,400	23,487,146

Appendix, Tables No. 28 to 32, pp. 55, 57.

The above table embraces the coals sent coastwise as well as that forwarded to foreign parts from the Durham and Northumberland coalfield.

For the other ports of the United Kingdom from which coal is shipped for foreign countries we are unable to give any continuous exact returns until 1819. The following table gives a summary of those shipments in each ten years from 1819 to 1850:—

* Those are the quantities given in the return of shipments north of the Humber, in excess of the other returns.

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SUMMARY of EXPORTS of COAL to FOREIGN COUNTRIES from English, Welsh, and Scotch Ports in each Ten Years, other than the Newcastle Ports, to 1850. Full Returns for each Year are given in the Appendix.

Appendix, Table No. 47, &c., p. 66 to 76.

——	1819 to 1830.	1831 to 1840.	1841 to 1850.
	Tons.	Tons.	Tons.
Bristol	57,101	72,615	86,685
Gloucester, including Sydney	667	9,587	14,932
Swansea	32,788	194,275	392,088
Cardiff	7,638	21,522	729,926
Newport	16,057	57,171	1,023,233
Llanelly	25,332	149,547	139,414
Pembroke	2,371	1,057	3,183
Cardigan, Beaumaris, and Carnarvon	Shipments unimportant.		
Chester	6,936	20,331	21,245
Liverpool	522,617	710,019	1,254,515
Runcorn	—	—	1,329*
Preston	—	—	8,192†
Fleetwood	—	227	3,718‡
Lancaster	2,207	3,896	4,473
Whitehaven	153,846	193,627	84,960
Maryport	—	—	12,979§
Gainsborough	—	—	2,535‖
Hull and Goole	11,669	—	—¶
Hull	—	120,880	461,861
Goole	—	36,041	30,323
Grimsby	572	1,303	7,372**
Glasgow	—	89,322	309,146
Irvine	—	98,234	419,070
Ayr	—	2,282	10,992††
Greenock	—	160,204	219,474
Grangemouth	—	61,758	97,938
Borrowstoness	—	244,949	660,912
Kirkaldy	—	61,256	253,288
Leith	—	94,733	120,093
Dundee	—	7,860	41,040
Alloa	—	—	200,990
Smaller ports	—	36,267	71,136

* Commencing in 1847.
† Commencing in 1843.
‡ Two years before 1840 for years since.
§ Since 1842.
‖ Seven years before 1850.
¶ Returned together.
** Six years before 1830; five years before 1840.
†† Six years before 1840.

The total shipments of coal from ports north of the Humber to foreign countries in each year to 1816 were as follows:—

Appendix, Table No. 34, p. 57.

	Tons.
1800	195,801
1801	193,853
1802	243,604
1803	210,976
1804	211,985
1805	221,613
1806	230,561
1807	187,603
1808	148,026
1809	120,241
1810	173,270
1811	175,237
1812	239,803
1813	161,495
1814	245,969
1815	301,534
1816	309,324

These returns show that up to this time the foreign trade in coal advanced but very slowly. From 1816 the total exports from the United Kingdom are available. The exports for each year, distinguishing until 1834 the quantities of coal sent to our colonial possessions from that sent to foreign countries, are given in the Appendix. From 1835 the quantities of coal, coke, and anthracite are given up to the end of 1869.

It is thought advisable, however, for the purpose of showing at one glance the regular rate of increase to the latter period, to abstract the larger table, and show the quantities shipped, and the

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increase in intervals of five years. The following table therefore gives the total shipments of coal to foreign countries in every fifth year since 1819:—

	Tons.	Increase over the previous year given.
1819	235,872	—
1824	279,192	43,320
1829	369,847	90,655
1834	615,255	245,408
1839	1,449,417	834,162
1844	1,754,171	304,754
1849	2,828,039	1,073,868
1854	4,309,255	1,481,126
1859	7,006,949	2,697,694
1864	8,809,908	1,802,959
1869	10,588,425	1,778,517

The large increase which is shown to have taken place since 1849 is directly connected with the total repeal of the duty on seaborne coal in 1850. We have consequently made that year the period from which we advance in continuation of our inquiry.

The detailed tables given in the Appendix will serve to explain any uncertain point in the general abstract given in the following table. Those tables show the exports for each year from all the ports named; but in the one annexed the exports to foreign countries for each ten years only is shown. Appendix, Table No. 47, &c., p. 66.

Attention may be drawn to a few of the more remarkable instances of a large increase in these shipments.

	1851 to 1860.	1861 to 1859.
	Tons.	Tons.
Newcastle	15,881,820	21,526,354
Sunderland	7,380,056	10,445,930
Stockton	993,684	10,246
Hartlepool	4,771,280	5,541,587
North Shields	2,191,966	2,496,370
Middlesborough	—	1,042,031*
South Shields	—	439,733†
Whitehaven	26,428	12,460
Maryport	35,644	60,110
Workington	13,016	16,364
Liverpool	4,227,398	5,845,895
Runcorn	3,239	31,580‡
Preston	10,184	6,600§
Fleetwood	22,424	7,684
Lancaster	17,695	25,648
Chester	9,599	9,742
Bristol	102,944	86,480
Gloucester	18,536	20,510
Newport	1,668,346	2,604,855
Cardiff	7,006,371	14,994,726
Swansea	1,711,665	4,398,810
Port Talbot	30,204	47,213
Neath	89,904	316,921
Porth Cawl	550	62,085‖
Llanelly	407,703	1,165,850
Milford	3,837	7,846
Hull	987,170	1,567,675
Goole	73,211	117,049
Grimsby	414,961	1,424,587
Boston	1,154	1,287¶
Gainsborough	3,515	7,227‖
Glasgow	511,969	969,757
Irvine	928,420	325,967**
Ayr	9,528	22,299
Greenock	306,707	782,538
Troon	—	730,606††
Ardrossan	—	466,901††
Grangemouth	362,142	931,911
Borrowstoness	1,076,054	1,642,388
Kirkaldy	405,939	1,164,266
Leith	272,114	645,409
Granton	—	143,374‡‡
Dundee	328,139	369,490
Alloa	524,367	656,642
Port Glasgow	57,373	107,814
Smaller ports	34,379	—

* 1861 is the earliest return published.
‡ Four years only given before 1860.
‖ Four years only before 1860.
** 1861, 1862, and 1863 only.
‡‡ Since 1866 only.
† Since 1866, previous years included in North Shields.
§ Six years only given before 1860; seven years only before 1869.
¶ For 1859 and 1860, and 1861, 1862, 1863, and 1865 only.
†† From 1863.

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Table showing a few of the more important increases of the nine years from 1861 to 1869 over the ten years from 1851 to 1861.

	Increase. Tons.
Newcastle	5,644,534
Sunderland	3,065,874
Hartlepool	770,307
Maryport	24,466
Liverpool	1,618,497
Newport	936,509
Cardiff	7,988,355
Swansea	2,687,145
Hull	580,505
Grimsby	1,009,626

The remarkable development of our foreign coal trade will be yet more strikingly shown by giving the increase which has taken place in each tenth year since 1819.

	Tons.	Increase. Tons.
Total export in 1819	235,872	—
1829	369,847	133,975
1839	1,449,417	1,079,670
1849	2,828,039	1,379,622
1859	7,006,949	4,178,910
1869	10,588,425	3,581,476

	Tons.
The actual total increase in the fifty years from 1819 to 1869 being	10,352,553
In the thirty years from 1839	9,139,008
In the twenty years from 1849	7,760,186
In the ten years from 1859	3,581,476

The rates of increase or decrease within the last ten years have been,—

	Increase. Tons.	Decrease. Tons.
In 1861 over 1860	533,283	—
1862 „ 1861	446,737	—
1863 „ 1862	—	26,640
1864 „ 1863	534,696	—
1865 „ 1864	360,569	—
1866 „ 1865	783,235	—
1867 „ 1866	462,066	—
1868 „ 1867	422,026	—
1869 „ 1868	—	422,026
1870 „ 1869	906,667	—

The return for 1870 is taken from the Board of Trade returns, which are given for three years, as follows. This will show pretty clearly where the large increase of the shipments of the last years have arisen, and also the decrease in the quantity shipped in 1868.

	1868.	1969.	1870.
	Tons.	Tons.	Tons.
To Russia	628,989	642,562	*820,514*
Sweden	333,035	277,598	*385,763*
Denmark	641,730	588,955	*695,704*
Prussia	584,455	540,344	547,541
Hanse Towns	767,693	782,800	*800,240*
Holland	260,048	247,082	*412,833*
France	1,925,661	1,999,920	*2,082,224*
Spain and Canaries	523,950	511,337	*584,310*
Italy, Sardinia	289,483	334,608	387,165
United States	105,421	86,291	*106,404*
Brazil	293,395	235,909	271,573
British India	542,888	463,951	426,575
Other Countries	3,941,056	3,907,068	3,965,156

The italic figures will show where the large increase has taken place. The following table of our foreign exports since 1856 will show the rate of increase yet more in detail. At the bottom of the table given, which is made up from month by month returns,* is given the total returns as given in the returns made to the House of Commons, so that every one may see the difference between the two returns. These differences arise from the circumstance that the returns are made up to a different period.

* Browne's Export List. An account of all coals, coke, patent fuel, and iron exported, &c. This list is published monthly, under the authority of the Queen's Letters Patent.
J. P. Higginson & Co.'s Monthly Export Coal Circular from 1865.
Monthly Export Coal Circular, W. & H. Laird, from 1857 to 1865.

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The EXPORTATION of COAL from the UNITED KINGDOM from 1856 to 1870, both inclusive, showing the Countries to which Exported.

COUNTRIES.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
France	1,136,299	1,283,509	1,344,342	1,400,188	1,370,228	1,473,540	1,384,668	1,285,514	1,387,675	1,562,627	1,898,125	1,949,488	1,879,296	2,022,888	1,950,046
Denmark	402,875	418,504	344,667	421,574	363,922	505,937	505,524	499,494	522,683	618,238	613,206	614,451	719,704	627,536	721,973
Norway	100,258	110,156	88,350	112,174	124,719	124,847	124,219	105,319	152,890	145,656	166,884	197,311	201,979	165,912	201,505
Sweden	135,858	172,040	142,093	165,248	194,129	210,037	217,338	198,888	222,242	241,496	253,026	258,509	316,069	261,129	370,294
Russia	213,553	293,801	306,306	322,976	327,282	376,231	387,098	419,070	437,688	465,989	520,014	544,000	573,768	587,761	761,781
Austria	65,780	101,600	99,423	85,255	101,651	66,721	60,062	61,118	98,404	59,481	76,102	83,017	71,980	93,946	80,707
Germany	543,300	628,488	679,264	660,174	670,662	732,806	679,411	647,359	680,414	735,528	724,121	791,906	868,806	861,406	885,927
Prussia	317,577	378,487	363,499	350,855	354,947	419,718	467,037	452,291	502,057	519,773	480,015	435,934	494,403	445,327	467,802
Holland	196,220	233,024	245,552	234,037	234,773	185,625	248,469	151,769	208,093	231,737	235,284	260,527	246,558	224,894	402,110
Belgium	37,739	70,888	65,890	52,488	47,786	43,943	27,001	25,678	20,785	21,905	64,843	155,588	91,702	87,121	122,030
Spain	182,339	214,478	251,423	339,661	346,861	374,955	414,480	444,928	438,588	388,971	424,433	381,581	406,729	372,877	445,474
Portugal	86,061	95,072	72,036	91,088	103,216	104,168	122,054	108,711	117,617	136,368	147,147	138,018	137,664	140,170	174,090
Italy	143,758	152,587	208,419	196,801	282,359	295,244	437,877	396,211	505,983	455,228	521,760	418,860	460,881	549,127	629,906
Mediterranean	349,288	218,013	258,534	361,828	295,593	291,299	300,870	340,887	415,550	371,399	389,021	365,836	371,916	368,710	449,995
Greece	35,557	23,999	27,868	33,478	31,479	26,441	43,293	30,229	21,880	35,638	29,642	38,490	42,070	33,937	42,953
Turkey	267,223	226,548	198,031	232,323	222,294	185,598	188,767	178,294	198,844	199,075	234,565	244,308	267,647	313,982	295,446
Africa	140,845	232,944	166,653	214,538	174,002	184,693	213,726	337,144	484,403	442,095	408,788	523,082	428,496	564,648	460,981
Australia	19,506	26,191	27,123	31,839	16,065	11,233	17,942	13,127	14,728	19,660	13,356	8,515	21,661	12,201	12,834
East Indies	208,319	453,384	258,807	348,968	504,318	352,435	537,104	603,614	542,032	545,190	660,086	990,286	649,175	692,356	622,046
West Indies	164,225	202,967	215,615	192,342	211,893	325,189	406,501	320,641	529,361	404,124	438,193	429,298	387,448	436,942	387,502
North America	309,499	299,038	363,628	299,787	428,316	493,677	448,601	426,756	334,354	344,381	312,272	277,176	315,552	253,754	312,592
South America	206,154	287,580	269,415	281,174	295,684	352,150	315,236	371,344	415,203	531,988	687,446	535,907	742,352	627,009	650,946
Channel Islands	57,575	65,397	61,851	64,293	66,506	68,628	67,481	66,338	62,270	70,076	67,748	72,948	68,126	66,831	74,372
Heligoland	..	..	95	84	..	90	84	..	..	..	128	..	270	..	..
Iceland	278	293	112	209	614	212	264	756	668	1,035	1,595	2,790	1,083	261	657
Azores	2,056	5,180	2,885	2,351	1,679	602	5,206	9,241	6,133	5,824	2,931	5,811	3,870	2,762	3,509
Canaries	10,727	4,586	561	3,280	4,759	8,379	13,877	9,042	10,323	7,198	11,317	7,906	9,674	9,102	12,141
Madeira	10,768	13,182	10,434	5,777	7,551	5,959	11,020	13,912	24,299	12,840	11,054	16,846	15,176	20,529	20,484
Ascension	2,277	11,884	585	7,295	3,433	686	2,469	3,061	640	2,709	4,747	6,744	2,219	2,015	1,611
St. Helena	1,406	1,480	1,857	322	..	657	802	3,147	1,213	1,915	811	1,755	625	922	68
Falkland Islands	..	..	..	..	..	100	873	1,266	858	260	2,491	715	101	779	393
New Zealand	327	135	515	1,268	200	790	1,966	3,693	5,956	6,189	6,615	3,969	2,346	1,378	273
Sandwich Islands	30	51	267	173	90	133	350	..	417	50	35	320	81	100	164
Ladrone Islands	..	664	..	..	..	..	..	..	..	..	..	..	..	..	..
Society Islands	..	..	1,171	1,418	1,049	..	..	..	..	..	30	..	..	..	..
Total	5,347,674	6,226,050	6,077,271	6,514,235	6,788,060	7,222,718	7,671,670	7,529,341	3,063,846	8,585,088	9,367,831	9,761,827	9,999,427	9,775,470	1,635,449
Total Exports as per House of Commons Return, which includes COAL, COKE, and ANTHRACITE	5,879,779	6,737,718	6,529,483	7,006,949	7,321,832	7,855,115	8,301,852	8,275,212	8,809,908	9,170,477	9,170,477	9,953,712	10,415,778	10,837,804	10,568,425

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A very detailed return of the shipments of coal to foreign states and British possessions will be found in the Appendix, giving all the foreign ports at which the coal has been received, and showing the districts from which the coal has been obtained. The following is a concise summary of the total shipments in each year from the several districts:

Appendix No. 126, p. 113, also for detailed account of the coal exports for 1869, see Appendix No. 127, p. 132.

	1858.	1860.	1862.	1864.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
From the NORTHERN PORTS, comprising Newcastle, Shields, Blythe, Amble, Sunderland, Seaham, Hartlepool, Stockton, Middleboro', Whitehaven, and Maryport	3,592,191	3,756,162	4,069,308	3,915,813	4,813,793	4,698,770	4,782,085
From the YORKSHIRE PORTS, comprising Hull, Grimsby, and Goole	253,063	260,182	289,724	295,702	379,640	442,531	404,159
From the LANCASHIRE PORTS, comprising Liverpool and neighbouring ports	467,802	590,128	623,450	742,279	678,704	621,856	550,538
From the WESTERN PORTS, comprising Bristol, Cardiff, Swansea, Newport, Llanelly, Port Talbot, Neath, and St. David's	1,381,953	1,739,260	2,132,016	2,493,740	3,053,539	3,141,971	3,296,565
From the SCOTCH PORTS, comprising Glasgow, Port Glasgow, Greenock, Grangemouth, Alloa, Borrowstoness, Troon, Ardrossan, and Inverkeithing	382,262	442,328	557,172	616,312	765,803	928,696	739,297
LONDON	—	—	—	—	70,348	115,142	52,826

SHIPMENTS of COAL to COLONIAL POSSESSIONS and FOREIGN COUNTRIES since 1850, when all duties ceased.

Date.	Coals.	Cinder. Coke.	Culm. Anthracite.	Total Exports.	Remarks.
	Tons.	Tons.	Tons.	Tons.	
1851	3,300,257	166,353	1,935	3,468,545	The duties on coals, &c. were wholly repealed from 14th August 1850.
1852	3,479,282	159,040	1,879	3,640,194	
1853	3,758,123	176,932	—	3,935,062	
1854	4,119,712	184,028	5,515	4,309,255	" "
1855	4,762,963	212,883	1,056	4,976,902	" "
1856	5,637,587	240,578	1,614	5,879,799	" "
1857	6,483,416	250,678	3,624	6,737,718	" "
1858	6,292,190	227,552	9,741	6,529,483	" "
1859	6,784,337	213,579	9,033	7,006,949	" "
1860	7,060,388	247,761	13,683	7,321,832	" "
1861	7,560,758	286,150	8,207	7,855,115	" "
1862	8,011,038	277,188	13,626	8,301,852	" "
1863	8,005,398	256,731	13,083	8,275,212	" "
1864	8,536,752	260,571	12,585	8,809,908	" "
1865	8,861,403	294,529	14,545	9,170,477	" "
1866	9,635,186	305,496	13,030	9,953,712	" "
1867	10,052,759	343,326	19,693	10,415,778	" "
1868	10,497,811	325,006	14,927	10,837,804	" "
1869	10,233,135	343,075	12,215	10,588,425	" "
1870	—	—	—	11,495,092	" "

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CHAPTER VII.—THE CONSUMPTION OF COAL.

SECTION 1.—MINING AND METALLURGY.

Mining.

A large quantity of coal is used in the processes by which the metalliferous ores and other minerals are raised from the earth. In a large number of our mines steam engines are employed for pumping water from their depths, for bringing the ores to the surface, for stamping and crushing the ores, not unfrequently for moving the various pieces of machinery which are employed in preparing the ores for the market, and in some cases for raising and lowering the miners. Endeavours have been made to arrive at correct results as to the number of mines employing steam power throughout the United Kingdom. The following list gives the actual number of mines producing the principal ores in 1869; the iron ores wrought in connexion with coal or in the coal measures not being included.

Metalliferous Mines of the United Kingdom.

TIN.

Tin Mines selling Ore in the Year 1869.

See Appendix for a list of the more important tin and copper mines. Tables 128 to 132 p. 137, &c.

	No. of Mines.
Cornwall	119
Devonshire	3
Total	122

COPPER.

Copper Mines selling Ore in the Year 1869.

	No. of Mines.
Cornwall	84
Devonshire	19
Cumberland	3
Lancashire	1
Cheshire	1
Cardiganshire	1
Carnarvonshire	8
Anglesea	2
Isle of Man	2
Ireland	7
Montgomeryshire	1
	129

ZINC.

Zinc Mines selling Ore in the Year 1869.

England.	No. of Mines.	
Cornwall	7	
Devonshire	4	
Cumberland	2	
Derbyshire	8	
Shropshire	1	
Staffordshire	1	23
Wales.		
Denbighshire	1	
Cardiganshire	2	
Montgomeryshire	4	
Flintshire	1	8
Isle of Man		2
Ireland		1
Scotland		1
Total		35

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LEAD.

Lead Mines selling Ore in the Year 1869.

ENGLAND.	No. of Mines.	
Cornwall	19	
Devonshire	3	
Somersetshire	4	
Derbyshire	71	
Staffordshire	1	
Shropshire	9	
Yorkshire	30	
Cumberland	36	
Westmoreland	7	
Durham and Northumberland	25	205
WALES.		
Cardiganshire	20	
Caermarthenshire	1	
Pembrokeshire	1	
Montgomeryshire	11	
Denbighshire	7	
Flintshire	26	
Carnarvonshire	14	80
ISLE OF MAN		6
IRELAND		3
SCOTLAND		8
Total		302

IRON.

Iron Ore Mines selling Ore in 1869.

	No. of Mines.
Cornwall	7
Devonshire	4
Somersetshire	3
Gloucestershire	24
Wiltshire	1
Oxfordshire	1
Northampton	13
Lincolnshire	3
Staffordshire	2
Lancashire	25
Cumberland	25
Yorkshire	16
Durham	8
WALES	5
ISLE OF MAN	1
IRELAND	14
	152

TOTAL of METALLIFEROUS MINES at Work in 1869.

Tin mines	122
Copper ditto	129
Zinc ditto	35
Lead ditto	302
Iron ditto	152
	740

A considerable number of those mines are worked under circumstances which do not require any application of steam power, and many of them are so situated that there is no necessity for using coal, except in the houses on the mine or in the smith's shop. Excepting in the deep mines of Cornwall and Devonshire, the steam power employed in the metalliferous mines is comparatively small. The following represents the coal consumption in our western mines:—

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CORNWALL.

Districts.	Number of Mines making Returns.	Number of Mines estimated.	Coal used for Engines.	Coal used for other purposes.	Total Coal consumed in Mines.	
			Tons.	Tons.	Tons.	
Western - - -	23	13	27,219	1,500	28,719	Appendix Tables No. 128 to No. 131, p. 137, &c.
West Central - - -	89	46	159,554	10,231	169,785	
East Central - -	10	15	12,938	303	13,241	
Eastern - - - -	31	12	30,602	694	31,296	
Total of Cornwall - -	153	86	230,313	12,728	243,041	
DEVONSHIRE.						
Devonshire - - -	20	28	10,852	2,308	13,160	Appendix Table 132, p. 140.
Total of Cornwall and Devon -	173	114	251,165	15,036	256,201	
Estimated for all the other Mines using steam power - -	—	254	215,250	14,750	230,000	

The total number of metalliferous mines using steam power - - 541

	Tons.
Total quantity of coal used in mines for production of steam - -	466,415
Total quantity used for other purposes in mines - - - -	29,786
Estimated quantity used in other mines of the UNITED KINGDOM - -	15,000
Total quantity of coal used in the metalliferous mines of the UNITED KINGDOM - - - -	511,201

Additional particulars are given in the Appendix of the coals consumed at some mines making special returns; of coals passing to the mines from LOOE by railway and canal; of the coal delivered ou the Tamar and the Tavistock canal; of the mining coal imported at Devoran, and its distribution; and of the general importation of mine and house coal at all the ports, with a general summary of mines making returns.

Appendix, No. 133. p.140
Appendix, No. 134.
Appendix, No. 135.
Appendix, No. 136. to
Appendix, No. 137.
Appendix, No. 138. p.143

COLLIERY CONSUMPTION. The colliery consumption of coal has been computed with considerable care. About two thousand returns have been made, giving the quantities of coal used for steam engines, bank fires, offices, and colliery allowance. The mean average of those returns has been taken as fairly representing the colliery consumption of the Kingdom. The result of this gives the colliery consumption for all purposes as 6,714,222 tons, or the total consumption for the mining operations of the British Isles as 7,225,423 tons.

See Appendix for a list of collieries, No. 27, p. 17.

METALLURGY.

TIN.—The quantities of tin ore raised and tin obtained in Cornwall and Devonshire during the last ten years have been as follows:

See Appendix for a list of smelters, No 139. p. 144.

Years.	Tin Ore.	Tin.
	Tons.	Tons.
1860	10,400	6,656
1861	10,963	7,016
1862	11,841	7,578
1863	14,224	9,104
1864	13,985	9,295
1865	14,122	9,038
1866	13,785	8,822
1867	11,066	7,296
1868	11,584	7,703
1869	13,883	9,356
	125,953	81,764

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Tin smelting.

The quantity of coal required to produce one ton of white tin is, on the average of all the varieties of ore smelted, according to the smelters returns, one ton, and about 5 per cent. of culm (anthracite) is required for a flux. This will give—

	Tons.
For the production of British tin in 1869 as - -	11,795
or the mean average of the ten years produce at 12,700 tons of coal per annum.	
For the refining of Foreign tin and the reduction of ore and regulus imported, there will be used of coal - - - - - -	10,080
Making the total quantity of coal used in 1869 - - -	22,679

Copper smelting

COPPER.—The production of copper ore from British mines and the quantity of copper produced for each of the ten years ending in 1869 was as follows:

Years.	Copper Ore.	Copper.
	Tons.	Tons.
1860	236,696	15,968
1861	231,487	15,331
1862	224,171	14,843
1863	210,947	14,247
1864	214,604	13,302
1865	198,298	11,888
1866	180,378	11,153
1867	158,544	10,233
1868	157,335	9,817
1869	129,953	8,291
	1,951,413	125,073

After careful inquiry, and the examination of returns obligingly furnished by the copper smelters, we have arrived at the conclusion that upon all kinds of ore the consumption will not be less than 18 tons of coal for every ton of copper produced. In this, we are to a great extent confirmed by Dr. Percy.* This will give the quantity of coal for the smelting of the British copper ore for 1869 as 149,238 tons, or for the annual average of the ten years ending 1869 as 225,126 tons of coal.

Foreign copper ore.

Of foreign copper ore, we imported in 1869 72,199 tons, producing about 11,500 tons of copper, requiring for its conversion into copper 207,000 tons of coal.

Regulars.

The colonial and foreign regulus imported amounted to 38,769 tons. This would require somewhere about 67,845 tons of coal in refining. The total of coal used in the copper smelting processes being

	Tons.
The reduction of British copper ores - - -	149,238
Do. colonial and foreign ores - - -	207,000
Do. do. regulus, &c. -	67,845
Total quantity of coal employed in copper smelting in this country - -	424,083

PYRITES.

PYRITES, SULPHUR ORES, Cupreous.—In addition to this, not less than 4,000 tons of copper were obtained by treating Spanish and other pyrites chemically.

Of the pyritic ores we imported in 1869, 319,947 tons. A portion of this contained no copper, and was used only in the chemical works for the sulphur it contains. Nearly 200,000 tons were treated for the copper. The copper thus produced would require about 36,000 tons of coal, thus increasing the coal used to 460,083 tons.

* "At these works from 13 to 18 tons of coal, which now (1859) costs 5*s.* a ton, are required to make one ton of copper, and about half of this quantity is consumed in the first and second operations of calcining and melting. A mixture of three parts by weight of free burning and one of binding coal is employed."—*Percy's Metallurgy, Vol. I. p.* 327.

"Fuel is the largest item of expenditure in copper works, and consequently a situation where suitable and cheap coal can be obtained is of great importance. The quantity of coal consumed will vary very much with its quality, and in a greater or less degree with the nature of the ores and the economy of management; but it may be generally estimated that in works such as those supposed there would be an annual consumption of about 20,000 tons of coal, or, for every ton of copper made from a mixture of ores yielding 10 per cent. of copper, 18 tons of coal."—*Percy's Metallurgy, Vol. I. p.* 500.

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Lead smelting.

LEAD.—The quantity of lead ore raised from the mines of the United Kingdom during the ten years ending 1869, of lead produced therefrom, and of silver obtained, were as follows:

Years.	Lead Ore.	Lead.	Silver.
	Tons.	Tons.	Ounces.
1860	88,791	63,225	549,090
1861	90,666	65,644	570,474
1862	95,312	69,013	686,123
1863	91,283	68,221	634,004
1864	94,463	67,081	641,088
1865	90,452	67,251	724,856
1866	91,051	67,391	636,688
1867	93,432	68,441	805,394
1868	95,236	71,017	841,328
1869	96,866	73,259	831,891
	1,027,539	680,543	6,920,936

According to a considerable number of returns which have been obligingly sent from the lead smelters, we are in a position to state that in smelting and desilvering the 96,866 tons of lead ore which were raised in 1869 there were used 145,299 tons of coal; or for the ten years given the average annual consumption given will have been 141,694 tons for all purposes.

The lead ore imported in 1869 amounted to 11,874 tons, and the pig and sheet lead to 52,683 tons. Nearly the whole of this, or 64,557 tons, will be desilverised, or subjected to some metallurgical treatment,* which appear to require for all purposes 32,278 tons of coal, or British and foreign lead 177,577 tons of coal.

* The cost of crystallizing one ton of Spanish lead is—

	s.	d.
Wages	9	5·4
Coals, 4 cwt.	0	8·4
Repairs	0	2·5
Total	10	4·3

The cost of calcining one ton of hard Spanish lead in the north of England is—

	s.	d.
Wages	1	11·2
Coals, 2·7 cwts.	0	4·7
Repairs	0	0·5
Total	2	4·4

Twenty-eight tons of slag smelted with cold blast consumed 392 cubic feet of air per minute:—

	£	s.	d.
Labour cost	3	7	8
Coke, 7 tons at 24s. 6d.	8	11	6
Total	11	19	2

Thirty-five tons of similar slag smelted with hot blast consumed 300 cubic feet of air per minute:—

	£	s.	d.
Labour cost	3	7	8
Coke, 5 tons 17 cwt. at 24s. 6d.	7	3	4
Turf for heating air, 11 loads at 1s. 8d.	0	18	4
Total	11	9	4

See "Percy's Metallurgy, Lead," and "Dr. Ure's Dictionary of Arts, Manufactures, and Mines," edited by Robert Hunt, F.R.S.

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Zinc.

Zinc smelting.

The production of zinc ores in the United Kingdom has not of late years been large. The following table shows the production of each county and the number of mines in each in 1869, as given in the Mineral Statistics for that year:—

——	Number of Mines.	Counties, &c.	Zinc Ore. Tons.	cwts.	qrs.
England - -	7	Cornwall - -	848	6	1
	4	Devonshire - -	87	5	0
	2	Cumberland - -	673	14	2
	8	Derbyshire - - -	50	0	0
	1	Shropshire - -	137	10	0
	1	Staffordshire - -	339	18	0
Wales - - -	1	Denbighshire - -	3,119	0	0
	2	Cardiganshire - -	69	12	3
	4	Montgomeryshire - -	111	0	0
	1	Flintshire - -	2,802	0	0
Isle of Man - -	2	- - -	7,218	17	0
Ireland - -	1	- - -	64	0	0
Scotland - -	1	- - -	12	0	0
Total *returned* -	35		15,532	20	2
An addition may be made to this of small parcels of which returns had not been obtained - -			525	0	0
			16,057	20	2

See Report of Committee B.

In addition to this we imported 41,736 tons of zinc ore, which was smelted in this country, making 57,794 tons submitted to metallurgical treatment. The quantity of coals required for this operation, according to the returns which have been furnished in confidence by the zinc smelters, would amount to 231,176 tons.

Iron.

Iron smelting.

This is by far the most important of our metallurgical operations, requiring the largest consumption of coal. The following table gives the summary of the returns of the make of pig iron in 1869:—

See Appendix for detailed return of BLAST FURNACES. No. 140. p. 145

——	——	Number of Ironworks active.	Number of Furnaces in blast.	Tons of Pig Iron made.
England - -	Northumberland - -	1	1	15,942
	Durham - - -	12	40	658,506
	Yorkshire, North Riding -	13	51	766,410
	Do. West Riding -	12	23	105,765
	Derbyshire - -	13	31	188,353
	Lancashire - -	6	27	436,662
	Cumberland - -	3	9	129,107
	Shropshire - -	10	23	197,443
	Staffordshire, North -	7	27	231,913
	Do. South -	48	95	569,562
	Northamptonshire -	4	7	41,500
	Lincolnshire - -	3	5	38,786
	Gloucestershire - -	6	11	81,306
	Wiltshire - -			
	Hampshire - -			
	Somersetshire - -			
	Total England -	138	350	3,456,255
Wales - -	North Wales - -	3	6	38,530
	South Wales—			
	Anthracite Furnaces -	2	9	27,909
	Bituminous Furnaces -	27	103	773,063
	Total Wales -	32	118	839,502
Scotland - -	- - -	29	132	1,150,000

	Tons.
England, Pig Iron made - - - -	3,456,255
Wales, ditto - - - -	839,502
Scotland, ditto - - -	1,150,000
Total make of Pig Iron in 1869 - -	5,445,757

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The result of extensive inquiries shows that under all circumstances of the varieties of iron ore, and the differences in the character of the fuel employed, that for all purposes about three tons of coal are employed to make one ton of pig-iron.

In the Appendix will be found a table which is of interest as showing the result of some of the recent improvements. Some statements have from time to time been made, that with a little more than one ton of coal in the furnace a ton of pig-iron has been made. Some examples are given in the report of Committee B., to which we refer. On the whole make of pig-iron with bituminous coal, however, we believe the computation adopted in the tables which follow on page will be found very near the truth.

Appendix, Nos. 141 and 141a, p. 151.

Report of Committee B.

Anthracite Iron.

Anthracite iron.

Much has been said respecting the experiments made by the late Mr. Samuel Blackwell at the Yniscedwyn Ironworks. By the kindness of Mr. Blackwell's nephew, Mr. J. Kenyon Rogers, who assisted him, we are enabled to give the following particulars, which are of considerable interest, looking at the probability of the more extended employment of anthracite for making steel iron in the future.

"The essential difference in our mode of working to that universally adopted in the anthracite districts was that we worked the furnace with *closed* foreparts, and we maintained that by so doing we saved a very large amount of the smelting power of the coal which by working with *open* foreparts they utterly wasted. The construction of the furnace was, of course, different, and this and a better distribution of the twyeres avoided the "scaffolding," which was what they thought must prevent any furnace with a closed forepart from keeping open." The following table was furnished by Mr. J. Kenyon Rogers, and shows the result:—

No. 1 and 2 furnaces, Yniscedwyn, three weeks ending June 3rd, 1866.

Average quantities of mine coal, &c., used per ton of iron made.

	Tons	cwts.	qrs.	lbs.
Native mine	1	15	0	24
Red ore	0	7	1	7
Llantrissant ore	0	5	1	3
Red Bilboa ore	0	3	3	4
Brown Bilboa ore	0	0	2	25
Scale	0	0	1	6
	2	12	2	13
Limestone	0	13	2	22
Coal in furnaces	0	13	2	9
Coal to boilers	0	8	3	2

Total make, 633 tons, all of which was No. 1, 2, 3, and 4, except 31 tons mottled.

N.B.—Other smelters in the neighbourhood use close upon 3 tons of coal to make 1 ton iron.

An ironmaster of large experience, who visited the Yniscedwyn furnaces, furnishes the following information:—

"I was with Blackwell at Yniscedwyn. I believe he had only one furnace working with anthracite at that time. When in good order the consumption of fuel was wonderfully small, a fraction over 20 cwt. to the ton of grey pig. But owing to the decrepitation of the coal, and constant choking of the furnace, it was constantly out of order,—cold almost to the hearth. Instead of a powerful blast, 6 or 7 lbs. to the square inch, as in the anthracite furnaces of America, I think he was barely able to command 2 lbs. I see no reason why, with a properly constructed plant, the same results should not be obtained in this country as in America, where the furnaces produce close upon 300 tons of iron per week, but with a consumption of coal in excess of 2 tons to the ton of iron. Pig-iron so produced should be particularly suitable for steel making, on account of the freedom of the anthracite from sulphur."

We learn from Overman * that the following were the results at Phœnixville, United States, No. 1 furnace, to produce one ton of anthracite pig-iron:—

	Tons.
Iron ore	2·59
Anthracite coal	1·83
Lime	1·14
No. 2 furnace:—	
Iron ore	2·65
Anthracite coal	1·89
Lime	1·15

We may, therefore, fairly compute the consumption of coal in the make of pig-iron in 1869 as being 16,337,271 tons; and the coal used in the conversion of this pig iron into malleable iron is estimated, according to returns received from the Mills and Forges, of which a list is given, as being 15,859,335 tons. The total quantity of coal used in our iron manufacture in 1869 being 32,207,706 tons.

Appendix, Table No. 142, p. 152.

In Steel Manufacture there will have been employed about 250,000 tons. But the use of the Bessemer process, and the introduction of Siemen's regenerative gas furnace, is very considerably reducing the quantity of coal used.

See Appendix, Table No. 143 for a list of Bessemer converters, p. 157.

Therefore there will have been nearly thirty-two million and a half tons of coal used in all the branches of the iron and steel manufacture.

See Appendix to Report B. for a list of Siemen's furnaces.

* Manufacture of iron by Frederick Overman.

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The following tables have been constructed for the purpose of showing from the year 1855 to 1869 the progress of this important industry, in relation to the total quantity of coal raised in each year.

Coal raised since 1865.

TABLES showing the quantities of Coal raised in Great Britain since 1865, the quantity exported in each year, and the quantity retained for Home Consumption, and the relation which this bears to each head of the Population.

Years.	Population.			Coal.				
	Great Britain.	Increase.	Per cent. Increase.	Raised.	Exported.	Retained for Home Consumption.	Increase or Decrease.	Total of Coal in relation to each Head of the Population.
				Tons.	Tons.	Tons.	Tons.	Tons cwts. qrs. lbs.
1855	21,792,872	—	—	64,307,459	4,976,902	59,330,557	—	2 14 0 5
1856	22,080,449	287,577	1·3	66,508,815	5,879,779	60,629,036	1,298,479	2 14 0 11
1857	22,369,463	289,014	1·3	65,274,047	6,737,718	58,536,329	2,092,707	2 13 1 10
1858	22,616,839	247,376	1·1	64,887,899	6,529,483	58,358,416	177,913	2 12 0 7
1859	22,810,069	193,230	0·8	71,859,465	7,006,949	64,852,516	6,494,100	2 16 3 12
1860	22,946,988	136,919	0·6	79,923,273	7,321,832	72,601,441	7,748,925	3 3 1 8
1861	23,181,790	234,802	1·0	85,512,144	7,855,115	77,657,029	5,055,588	3 7 2 6
1862	23,416,264	224,474	1·0	83,510,838	8,301,852	75,202,986	2,444,043	3 4 1 1
1863	23,655,482	239,218	1·0	88,165,465	8,275,212	79,890,253	4,781,267	3 8 1 20
1864	23,891,009	235,527	1·0	92,662,873	8,809,908	83,852,965	3,962,712	3 1 0 21
1865	24,127,003	235,994	1·0	98,150,587	9,170,477	88,980,110	5,127,143	3 13 2 24
1866	24,363,433	236,425	1·0	101,506,794	9,367,749	92,139,045	3,158,935	3 15 2 15
1867	24,599,277	235,844	1·0	104,375,480	9,761,827	94,614,153	2,475,108	3 17 3 19
1868	24,837,502	238,225	1·0	103,014,207	10,497,811	92,516,396	2,097,757	3 14 2 0
1869	25,075,088	237,586	1·0	107,299,634	10,283,135	97,066,499	4,550,103	3 17 1 19
1870	25,323,000	247,912	1·1	—	—	—	—	—

Pig and bar iron made since 1865.

TABLE showing the make of PIG IRON and the manufacture of BAR IRON, &c. since 1855, the quantity of COAL consumed, the quantity left for all other purposes, and its relation to the Population.

Years.	Coal kept for Home Consumption.	Make of Pig Iron.	Coal consumed in make of Pig Iron.*	Pig Iron Exported.	Pig Iron left to be converted into Bar Iron, &c.	Coal required to convert the Pig into Bar Iron, &c.†	Total of Coals used in Iron Manufacture.	Coals left to be consumed for all other Purposes.	After Coal Consumption for Iron Manufacture leaves for each Head of the Population.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons cwts. qrs. lbs.
1855	59,330,557	3,218,154	9,654,462	291,776	2,926,378	9,803,366	19,457,828	39,872,729	1 16 2 10
1856	60,629,036	3,586,377	10,759,131	357,326	3,229,051	10,802,370	21,561,501	39,067,535	1 6 1 8
1857	58,536,329	3,659,447	10,978,341	422,086	3,237,361	10,845,159	21,823,500	36,712,829	1 12 3 8
1858	58,358,416	3,456,064	10,368,192	363,143	3,092,921	10,361,285	20,729,477	37,628,939	1 13 1 10
1859	64,852,516	3,712,904	11,138,712	316,376	3,396,528	11,378,368	22,517,080	42,335,436	1 17 0 13
1860	72,601,441	3,826,752	11,480,256	342,566	3,484,186	11,672,023	23,152,279	49,449,162	2 3 0 12
1861	77,657,029	3,712,390	11,137,170	388,004	3,324,386	11,136,592	22,273,762	55,383,267	2 7 3 3
1862	75,202,986	3,943,469	11,830,407	444,454	3,499,015	11,721,700	23,552,107	51,650,879	2 4 0 13
1863	79,890,253	4,510,040	13,530,120	466,275	4,024,765	13,482,962	27,013,082	52,877,171	2 5 2 23
1864	83,852,965	4,767,951	14,303,853	465,985	4,301,966	14,411,586	28,715,439	55,137,526	2 6 0 3
1865	88,980,110	4,819,254	14,457,762	543,018	4,276,236	14,325,390	28,783,052	60,197,058	2 9 0 8
1866	92,139,045	4,523,897	13,571,691	497,133	4,026,759	13,489,647	27,061,338	65,077,707	2 13 1 19
1867	94,614,153	4,761,023	14,283,069	567,319	4,193,704	14,048,908	28,331,977	66,282,176	2 13 3 15
1868	92,516,396	4,970,206	14,910,618	555,020	4,415,186	14,790,873	29,701,491	62,814,905	2 10 2 9
1869	97,066,499	5,445,757	16,347,371	711,612	4,734,145	15,859,335	32,207,706	64,858,793	2 11 2 17

* This is estimated, from the average of Returns furnished from each Iron producing district, at three tons of coal—for Blast Furnace, Engine Fires, and all other purposes—in producing one ton of Pig Iron.
† Estimated, in like manner from Returns furnished, t three tons, seven cwt., for converting each ton of Pig Iron into Finished Iron, every operation included.

Appendix, Table No. 24, p. 15. Appendix, No. 35, pp. 58, 59.

The progress of the iron manufacture is so immediately connected with the consumption of coal that much attention has been given to it. In the Appendix will be found sundry tables showing the condition at various periods. In 1806 we find the make in Derbyshire to have been 10,329 tons. In 1823 and 1830 the make of iron was as follows:—

	1823.	1830.
	Tons.	Tons.
Northumberland and Durham	2,379	5,327
Yorkshire	27,311	28,926
Derbyshire	14,038	17,999
Shropshire	57,923	73,418
Staffordshire	133,590	211,604
South Wales	182,325	277,649
Scotland	24,500	37,500
Total	442,066	652,423

From this period there was a steady progress made in our make of pig iron until, as shown in the above table, we made 3,218,154 tons in 1855, which advanced rather more than *two million tons* in fifteen years. For the make of pig iron alone more than six million tons of coal were consumed in 1869 than in 1865.

Appendix, Table No. 143 a, p. 157.

The exports of our iron for the three years ending 1869, and our imports for the same period, will be found in the Appendix, so that the exact position of our iron trade can be studied with facility.

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SECTION 2.—CLAY, AND ITS MANUFACTURES.

porcelain clay

Porcelain Clay (*Kaolin*).

The most valuable clay produced in this country is the China clay of Devonshire and Cornwall.

I learn upon inquiry at several of the largest clay works of Cornwall and Devonshire that from 150 lbs. to 3 cwt. of coal are required to dry a ton of clay, according to the state of moisture in which it is turned into the drying kilns. If very wet the larger quantity is required; if moderately dry the smaller quantity will suffice. All the clay is now artificially dried. We may therefore fairly take 2 cwt. of coal as the average quantity required for drying a ton of China clay.

The quantity of clay produced in Cornwall and Devonshire during the six years ending 1869 has been as follows:

	1864.	1865.	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cornwall - -	95,750	97,750	105,000	127,000	100,000	107,700
Devonshire - -	8,500	8,750	12,000	12,000	11,000	11,700
Total - -	104,250	106,500	117,000	139,000	111,000	119,400

Therefore in 1864 - - 10,425 tons of 2,240 lbs. of coal were consumed.
1865 - - 10,650 " " "
1866 - - 11,700 " " "
1867 - - 13,900 " " "
1868 - - 11,100 " " "
1869 - - 11,940 " " "

The best authorities, those who have long been connected with the porcelain clay trade, do not anticipate any increase of moment in the demands for kaolin; therefore it may be fairly inferred that 12,000 tons fully represents the quantity of coal used in the preparation of Cornish clay for the market.

Teignmouth Clay.—The clay worked around Newton in Devonshire and at Bovey Tracey. All this clay is shipped at Teignmouth, and we find it to amount to 44,500 tons. Of this, it appears that more than 12,000 tons are used in the manufacture of tobacco pipes. No coal is used in the preparation of this clay. A small quantity is, however, employed in the Bovey Tracey potteries, at the various works near Newton, and at the terra cotta works between that place and Torquay.

Poole Clay, *Dorsetshire*.—More than sixty thousand tons of this clay were exported in 1869; of this quantity the following foreign ports received—

	Tons.
Copenhagen - - - - -	1,010
Bremen - - - - - -	874
Quebec - - - - - -	800
Stockholm - - - - - -	711
Dordt - - - - - -	600
Rouen - - - - - -	300
Seville - - - - - -	290
Carthagena - - - - - -	200
Dysart - - - - - -	80
Total - - - -	4,865

All the rest of this clay was used in the English potteries, the largest proportion being conveyed to the Lambeth potteries.

Stourbridge Clay and clays of the coal measures generally.—The best glasshouse pot clays have the following composition:

Silica - - - -	68·70	72·04	79·25
Alumina - - -	26·47	18·79	13·57
Peroxide of iron - -	2·19	1·68	1·38
Magnesia - - -	0·65	0·69	0·08
Phosphates - - -	trace.	trace.	0·42
Water and organic matter -	1·99	6·80	5·11
Total - -	100·00	100·00	99·81

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"The importance of the brick trade is illustrated by the following. The quantity of bricks made per annum in the Kingdom is 1,800,000,000. Of this quantity, Manchester alone makes 130,000,000 per annum. What are termed the London makers produce about the same quantity, but bricks are sent to the Metropolis from a circuit of 100 miles; it is therefore impossible to give exactly the consumption. Taking bricks at the low average of three tons per 100, the annual make exceeds in weight 5,400,000 tons, and the capital employed must be upwards of 2,000,000*l.* sterling."*

See Appendix for details No. 144.

The computation made, upon the returns received by this Committee, does not differ much from the above. We make the number as 2,503,004,600, and the value thereof as 2,911,980*l.*

The Coal used in burning Bricks.†

Burning bricks.

To attempt to give the cost of manufacturing would only mislead. The largest item is labour * * * * The next is coal or fuel for burning, which ranges from 3*s.* to 20*s.* per ton, according to the district of country. Again, one clay requires a large expenditure of fuel to be used, in order to attain the most intense heat, while another will burn sufficiently hard at about 10 degrees Wedgwood. The consumption of coal for burning bricks varies with the clays from 3 cwt. to 20 cwt. per 1,000."‡

In a letter from the manager of the Lilleshale's Company Works, Shropshire, to Mr. Chamberlain, we are told that their new "ovens will contain from 12 to 13,000 bricks, and require from 7 cwt. to "8 cwt. of small coal to burn them * * * * The old brick ovens at this work would contain "about 7,000 bricks, one ton of coal per 1,000 was required, &c., &c."

In the discussion on those papers at the Society of Arts, a Mr. Ayton said, "Assuming the number "of bricks made in and about London to be 200,000,000, and this he believed was a tolerably correct "estimate, and allowing half a ton of coals for each 1,000 bricks for drying and burning, the con-"sumption of coals would be increased by one hundred thousand tons." That is, by using Mr. Chamberlain's process, which required all coal, instead of "refuse dust and ashes, now profitably turned to account."

Mr. Versmann, who was for some time an assistant to Mr. Graham at the Royal Mint, gave the following important information on the question before us:—

A pretty accurate estimate of the expenditure of heat in burning bricks may be formed by comparing the quantity of fuel actually used with the quantity of heat theoretically required. The following data will enable us to make the calculation:—1,000 bricks ready for the kiln weigh about 10,000 lb., and lose during burning about 15 per cent., or 1,500 lb. One pound of water requires for evaporation 652 units of heat. The steam escapes from the kiln at a temperature of about 300 deg. Cent., and it must, therefore, be heated from 150 deg. to 300 deg. Cent. The specific heat of steam is ·847. The bricks themselves, weighing 8,500 lb., are heated to about 1,200 deg. Cent., and the specific heat of clay may be taken as ·200.

These data give the basis for the following calculation:—1,500 lb. of water to be converted into steam require 1,500 × 652 units of heat = 978,000 units; 1,500 lb. of steam to be heated to 300 deg. Cent. require 1,500 × 150 × 0·847 = 190,575 units; 8,500 lb. of dry bricks to be heated to 1,200 deg. Cent. require 8,600 × 1,200 × 0·200 = 2,040,000; total 3,208,575 units of heat.

Now to burn 1,000 bricks in a common kiln, certainly not less than 10 cwt. of coal are required, or an absolute heating effect of 8,000 units, which is equal to 10 × 112 × 8,000 = 8,960,000 units of heat. Therefore the proportion will stand thus:—Units of heat theoretically required, 3,208,575; units of heat practically required, 8,960,000; difference, 5,751,425, or 64 per cent.

This calculation shows an actual waste of 64 per cent. of heat; but even this is not all, as we must not forget that the whole of the heat required to raise the temperature of the ordinary kiln to 1,200 deg. Cent. is entirely lost in the subsequent cooling. The most serious loss is chiefly due to the following causes:—The kiln, being allowed to cool after each burning, the whole brickwork must be heated afresh each time. A strong radiation of heat also takes place from the walls during burning. Further, a large amount of air is uselessly heated in the fireplace at the beginning, and the flame escapes too directly and too rapidly towards the end of the operation. Now all these difficulties are overcome in the construction of Hoffmann's kilns, because in them the air required for sustaining combustion is passed over bricks which have been burnt a day or two before, and is heated to at least 300 deg. Cent. The waste heat, therefore, instead of escaping directly into the chimney, passes over air-dried bricks, which lose all their moisture and actually become red-hot before any fuel is used. The vast importance of these two points can easily be shown by calculation. One cwt. of coal requires for complete combustion about 1,000 lb. of air, which are brought to the temperature of the fireplace at the expense of part of the coal. The amount of heat required to raise the temperature of 1,000 lb. of air to 30 deg. Cent. is the same as will raise 0·2669 × 3 × 1,000 = 800 lb. of water from 0 deg. to 100 deg. Cent. Taking the heating effect of the coal as equal to 8,000 units, the required heat will be obtained by $\frac{800 \times 100}{8{,}000}$ = 10 lb. of coal, or about 9 per cent. of the coal to be burnt. The benefit of of utilising the waste heat is, therefore, twofold—(1) the moisture of the bricks is converted into vapour; and (2) the heat accumulates in the bricks.

One thousand air-dried bricks contain, as stated above, about 1,500 lb. of water, which require from 1¾ per cent. to 2½ per cent. of coal for evaporation, or about 25 per cent. of the whole quantity of coal required for burning 1,000 bricks. The heat accumulated in the bricks may be estimated by assuming that the bricks require to be heated to 1,200 deg. Cent., and that the first 300 deg. Cent. are furnished by the waste heat, which is equal to 15 per cent.

From this it is evident, that in the processes of brick manufacture, not less than 900,000 tons of coal are used in the arrangements ordinarily used. The introduction of Hoffman's annular kilns promises

See Appendix No. 145 for a list of those kilns, p. 159.

* The Manufacture of Bricks by Machinery, by Henry Chamberlain, Kempsey, near Worcester, Journal of the Society of Arts, June 5, 1856. On the Drying and Burning of Bricks, by the same Society of Arts Journal, June 13, 1856.

† Chamberlain on the Drying and Burning Bricks.

‡ The quantity of clay used in Shropshire for 1,000 bricks is 3 tons 12 cwt., and to burn these 1 ton of coal is required.

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to effect a vast saving in the manufacture of bricks, and all kinds of clay goods. This kiln requires from us some brief explanation. Hoffman's kilns.

The kiln substantially consists of a long railway-tunnel-shaped passage, forming a long annular channel or ring. This ring is divided into twelve, or, as in the case of the oblong annular kiln, fourteen compartments, which may be made to communicate or to be separated from each other by the raising or lowering of a partition or damper. These intercepting dampers are lowered in grooves built into the walls of the furnace immediately after each flue; or inserted from the side through the doorways. To each compartment there is an entrance doorway, which can be closed with temporary brickwork. Flues lead from the bed of each compartment to the central smoke chamber, which communicates by a main flue with the chimney outside.

The following important description of this arrangement by Professor J. Thomson is abstracted from the Journal of the Chemico-Agricultural Society of Ulster, and will convey in the fewest words the most accurate account of the process of burning bricks by the use of Hoffman's kilns.

After giving explanations of the chemical composition and other characters of different kinds of clays, and the changes which they undergo in being burnt or raised to an incandescent heat, Professor Thomson explained the chief methods in use for working the clay and forming it into bricks ready for the kiln. He then turned attention to the great loss of heat which occurs in the ordinary modes of burning bricks in common kilns. This great loss, he pointed out, arises in a twofold way. First, during the burning of the bricks, the air which has passed through the fuel, or among the heated bricks, and the smoke including gaseous products generally, passes away from the kiln to waste at a very high temperature, even at a red heat, during a considerable part of the process. Secondly, when the bricks are raised to the high temperature required to burn them, and render them permanently hard, the great store of heat which they contain is entirely thrown to waste while they are left to cool. He stated that he has noticed with much interest the very admirable principles of a new kind of kiln with perpetually revolving fire, which, invented and patented by F. Hoffmann, of Berlin, and A. Licht, of Danzig, is being introduced into Ireland by Mr. Moore, of this town, both for brick-burning and lime-burning. In this new kiln a most remarkable economy of fuel is effected in a twofold way; in fact, by saving the twofold loss of heat already mentioned; for, first, it saves the heat of the gaseous products of combustion and unconsumed air passing through and away from the burning bricks, by applying this heat effectively in drying the new fresh bricks about to be burnt, and raising them up to an incandescent temperature, so that only a very slight addition of heat directly from ignited fuel is required to complete their burning; and, secondly, it saves the heat of the cooling bricks, after their having been sufficiently fired, by applying it all in warming the air which goes forward to supply the fires; so that the fuel is burnt with air already at an incandescent temperature, instead of requiring, as usual, to heat the air for its own combustion. Professor Thomson, with the aid of drawings, went on to explain the manner in which these principles are practically carried into effect, taking as an example the large kiln which Mr. Moore is constructing at his brick-works at Hayfield, in the neighbourhood of Belfast. The kiln is built in the form of a large arched passage, like a railway tunnel, bending round in going forward on the ground till it closes with itself to form a great circular ring-chamber, within which the burning of the bricks is carried on. This ring-chamber may be of any convenient dimensions, 160 feet diameter being a suitable size. Round its circumference there are twenty-four entrance door-ways, admitting of being closed with temporarily-built bricks and clay, so as to retain the heat and exclude all entrance of air by the door-ways so built up. The great ring-chamber may now be conceived as consisting of twenty-four compartments or spaces, with one of these door-ways to each. In the centre of the ring a high chimney is erected, and from each of the twenty-four compartments of the annular chamber an underground flue leads into the chimney. There are, then, twenty-four of these flues converging towards the centre like the spokes of a wheel, and each flue has a valve, by which its communication with the chimney can be cut off. Arrangements are made by which a partition like a damper or portcullis can be let down at pleasure, so as to cut off all communication between any of the twenty-four compartments of the ring-kiln and the next one. Let us now suppose the working of the kiln to have been already fairly established, for, after being once kindled, the fire is never extinguished, but the burning of new bricks and the removal of the finished produce, is carried on by a continuous and regular process from day to day. Two adjacent compartments have this day their entrance-doors open, all the rest being perfectly closed. By the arrangement of the valves in the flues, and the large damper or portcullis, the air, which gets admittance alone by the two open doors, has to go round the whole circuit of the ring-kiln in order to be drawn into the chimney. From one of the two open compartments men are taking out the finished and cooled bricks, and, in the other one, they are building up newly-formed unburnt bricks which are not yet quite dry. The air entering by these two compartments passes first among bricks almost cold, and takes up their heat, and then goes forward to warmer bricks, and then to hotter and hotter, always carrying the heat of the cooling bricks forward with it till it reaches the part of the ring diametrically opposite to the two open and cold compartments. At this place it gets a final accession of heat from the burning of a very small quantity of coal-dust, which is dropped in among the bricks from time to time by numerous small openings furnished with air tight movable lids. Thus, at this part of the kiln there is generated the full intensity of heat which is required for the burning of the bricks. The hot air, including the products of combustion, which, for brevity, we may call the smoke, though it is really perfectly gaseous and free from sooty particles, then passes forward to the bricks, which by its continuous current, are being heated; and it passes on among them from hot bricks to those which are less and less hot, heating them as it goes, and then passes on to those which are still damp, drying them as it goes; and then it passes to the chimney, in a state almost cold, and saturated with the moisture, in the form of steam or vapour, which it has taken from the damp bricks. On the following day to that on which the operations just described have been going on, the portcullis is shifted forwards by the space of one compartment, and a corresponding change is made as to the flue which is to communicate with the chimney, and as to the pair of compartments open for the admission of air and for the removal of finished cold bricks, and the building in of fresh damp bricks; and the air, including products of combustion, at the end of its circuit in the annular chamber, just before passing off to the chimney,

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now passes among the fresh bricks which were described as built in on the yesterday of this new day. The place where the coal-dust for fuel is thrown in is also advanced round the circle by the stage of one compartment; and so now the whole process goes on just as it did yesterday. The fire thus makes a complete circuit of the annular chamber in twenty-four working days, the whole process being left dormant on Sundays, merely by the closing of all apertures for the admission of the current of air. The same kind of kiln, with the same process of working, is applicable in the burning of lime; and, both for the brick-burning and the lime-burning, the saving of fuel, relatively to what is consumed by the ordinary methods, is such as to appear at first sight almost incredible.

Lime.

Lime burning.

It is not easy to compute the quantity of lime burnt annually in the United Kingdom for building, for agricultural, and other uses. The following is the quantity of coal used:—

At the London Docks 7,000 tons of limestone were burnt with little more than 1 ton of coal to 11¼ tons of stone, the limits being 1 to 10 and 1 to 13. Welsh coal being used at Leith, one ton of coal of the neighbourhood burns only 6 or 7 tons of lias lime.

Nine tons of coal will burn 100 tons of stone, which produces 59·37 tons of quick lime, or 1,583 bushels of ground lime.*

After a careful consideration of the whole subject, we have been induced to estimate the quantity of limestone of all kinds burnt as not less than 5,000,000 tons, and, taking the above data for our guidance, we estimate the quantity of coal consumed as equal to 360,000 tons.

We have already alluded to the Hoffmann's annular kiln for burning bricks. The following information has been supplied us in reference to lime burning:—

A large lime-kiln at Llandulas, North Wales, burning 70 to 80 tons per day, consumes 3½ cwt. of fuel per ton of lime, at a cost of 1*s.* 3*d.*, fuel costing 1*s.* per ton. The Tryfynant Limeworks consume annually 1,400 tons of slack. Another large kiln at Wrexham, belonging to the Minera Lime Company, in the same locality, burning daily from 80 to 85 tons of lime, pays 1*s.* 1*d.* for fuel consumed per ton of lime, or burns at the rate of 3 cwt. per ton.

EARTHENWARE MANUFACTURES.

Porcelain, Common Pottery, Tiles, &c.

Appendix, Tables Manufactures No. 146, Table 23, p. 181.

The table given of the Staffordshire Potteries show that 560,090 tons of coal were consumed in that district only. We have been furnished with an estimate of the coal used in the kilns only of the following works:—

Stoke	7 works.
Hanley	30 „
Burslem	48 „
Tunstall	19 „
Fenton	14 „
Longton	55 „

173 × 1,500 tons used in one of the works, and considered as a fair average, is equal to 259,500 tons of coal.

Appendix, No. 146, p. 160.

The returns given in the Tables of Manufactures are our only guide to the quantities of coal used in other works of this class. These returns give about 120,000 tons. To this may be added, for works from which no return has been received, not less than 50,000 tons. Therefore, if we may take the following as nearly correct:—

	Tons.
Potteries	560,090
Other returns	120,000
Estimated	50,000
	730,090

Glass.

Appendix, No. 146, p. 160.

Beyond the returns given in the Tables of Manufactures, which give the following as the coal used in ordinary glass manufacture:—

	Tons.
Durham	67,348
Northumberland	24,573
Lancashire	98,800
London	154,537
Bristol	9,706
Yorkshire	11,193
Worcester	4,200
Edinburgh	8,935
Dublin	7,500
Belfast	11,623
Total returned	398,415

* On the Concrete used in the late Extension of the London Docks, by George Robertson, C.E. From Transactions of Scottish Society of Art.

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	Tons.
The Staffordshire district consumed in the window and plate glass manufactures -	165,000
And in flint glass works - - -	27,000
	590,415
Beyond the above we are disposed to estimate for works from which no return has been received as - - - - - -	150,000
Total of coal used in glass making -	740,415*

Brewing, Malting, &c.

Coal used by Brewers.—The Chancellor of the Exchequer has recently stated in the House of Commons, that in 1870 25,889,743 barrels of beer were brewed in the United Kingdom, this being 0·823 barrels per head of the population. Extensive inquiries have been made of the large and small brewers throughout the country as to the quantity of coal employed by them. The lowest return received has been three tons of coal and slack to each hundred barrels of beer; the highest being four tons eleven hundredweight of coal. The mean of all the returns received will give 1,165,000 tons of coal as the quantity employed to produce the above quantity of beer.

* Plate Glass.	Superficial Feet.		Square Feet.		
	1860.	1861.	1862.	1863.	1864.
Exports.					
France - - - - -	—	—	10,715	—	—
Russia, Northern Ports - - -	4,838	2,205	—	—	11,237
China - - - - - -	—	4,655	—	—	—
United States - - - -	267,352	33,227	24,025	104,424	132,330
British Possessions of South Africa - -	6,436	11,213	7,934	10,239	11,560
British East Indies - - - -	59,996	45,755	21,224	33,690	33,163
Hong Kong - - - - -	—	2,365	—	—	—
Australia - - - - -	62,895	55,887	112,749	97,400	66,043
British North America - - -	10,262	10,129	—	12,803	6,870
Hamburg - - - - -	—	—	—	20,168	—
Holland - - - - -	—	—	—	11,256	17,656
Other Countries - - - -	24,903	24,335	30,836	40,585	49,754
Total - - -	438,682	189,771	207,483	330,205	328,613
Plate Glass, Rough.					
Holland - - - - -	—	—	41,535	63,167	—
United States - - - - -	—	—	—	—	1,260
India, Singapore and Ceylon, and British India - - - - -	—	—	32,928	11,392	32,031
Other Countries - - - -	—	—	35,359	36,412	32,176
Total - - -	—	—	109,822	110,971	75,487
Total of Polished and Rough Plate -	433,682	189,771	317,305	441,176	404,100
Imports.					
Holland - - - - Lbs.	435,776	124,656	467,792	214,256	263,536
Belgium - - - - „	763,673	1,431,920	929,376	565,824	1,036,336
France - - - - „	314,742	49,168	1,006,232	821,520	1,817,872
Other parts - - - - „	41,098	35,056	1,792	2,464	2,240
Total - - -	1,555,289	1,640,800	2,385,192	1,604,064	3,139,984

*The influence of unrestricted action in plate-glass manufacture was the saving of no less than 80 per cent. of coal in quantity alone. The cost of coal, which in London, in 1826, exceeded 1*s.* 10*d.* on each superficial foot of glass, is now 2*d.*

Owing to the circumstance that our manufactures have neglected the first-class plate manufacture, there has been a greatly increased importation of fine plate-glass from Belgium and France.

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MALTING.

COAL USED IN MALTING.—An authority of eminence, who has been closely engaged in examining the question of the production of malt and of beer, has given the following table of the average production of malt in relation to the population:—*

Average Years.	Average Population.	Average Number of Bushels of Malt charged with Duty.	Number of Bushels per Head.
1820–29	12,780,000	26,511,000	2·08
1830–39	14,600,000	33,339,000	2·28
1840–49	16,600,000	32,366,000	1·94
1850–59	18,600,000	35,620,000	1·90
1860–68	20,800,000	42,121,000	2·02
1869	—	54,367,927†	—

Bituminous coal, anthracite coal, and coke are used in the process of malting, and we have not been able from our return to separate with any degree of exactness one of these from the other. The average of all the returns obtained gives about 1 ton of fuel to every two hundred bushels of malt made. This will give, for the malt made in 1869, above 210,000 tons of mixed fuel. Estimated according to the best information at our disposal of the coke used as coal, it will show that certainly 275,000 tons of coal (bituminous and anthracite) were used by the maltsters. Thus, in producing the beer used in 1869, we consumed,—

	Tons.
For malting	275,000
,, brewing	1,165,000
	1,440,000

DISTILLERS.

COAL USED BY DISTILLERS.—The SPIRITS charged with duty amounted to 24,074,923 gallons.‡ Our inquiries lead us to believe that for distillation and rectification about 250,000 tons of coal will be required.

* Leone Levi. The Statistics of Beer. Times, June 10th, 1871.

† MALT &c. UNITED KINGDOM. 1869.

	Bushels.
Malt charged with duty in 1869	49,400,262
Malt free of duty in 1869	4,967,665
Total Bushels	54,367,927
Malt exported free of duty in 1869	[a]1,799,588
Malt retained for home consumption	52,568,339
Total Bushels	54,367,927

[a] Includes the estimated quantity used in beer exported.

‡ SPIRITS. UNITED KINGDOM. 1869.

	Gallons.
Spirits charged with duty	22,519,817
Spirits free of duty	1,555,106
Total Gallons	24,074,923
Spirits exported free of duty	[b]2,133,144
Spirits retained for home consumption	21,941,779
Total Gallons	24,074,923

[b] The quatitities here stated include spirits shipped to foreign countries as merchandise and ship stores.

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SECTION 3.—TEXTILE AND FELTED MANUFACTURES.

WOOLLEN AND WORSTED.

In 1850 there were in England and Wales 1,306 factories for woollen goods, and 493 worsted factories. In 1861 these had increased to 1,456 woollen factories, and 512 worsted factories. In 1868 the number of woollen factories were reduced to 1,420, but the worsted works were increased to 687; the total number of spindles and power looms in those years being as follows:—

See the Appendix for the returns from the manufacturing counties, Tables 146, &c., p. 160, &c.

—	Woollen.		Worsted.	
	Spinning Spindles.	Power Looms.	Spinning Spindles.	Power Looms.
1850 - - -	1,356,691	9,170	864,874	32,617
1856 - -	1,499,949	13,726	1,298,326	38,809
1861 - - -	1,846,850	20,344	1,245,526	42,968
1868 - -	4,222,916*	42,571	2,149,024	71,556

There being an increase in 1868 of 2,866,225 spinning spindles over the number returned in 1850 as employed in woollen manufacture, and of 1,284,150 in the same period in the worsted manufacture; while an addition has been made in the same period of 33,401 power looms in the woollen and 38,939 in the worsted manufacture. The motive, horse-power, *steam*, employed in those factories, spinning and weaving, we are enabled to give from the Miscellaneous Statistics of the Board of Trade for the four separate years as follows:—

Woollen.

—	Spinning.	Weaving.	Spinning and Weaving.	Other Processes.	Total of Steam Motive Power.
1850 - - -	6,684	20	4,259	1,604	12,567
1856 - - - -	6,705	—	7,721	1,839	16,265
1861 - - -	7,690	268	14,313	2,962	25,233
1868 - - - -	9,094	497	22,097	3,192	34,880

Worsted.

—	Spinning.	Weaving.	Spinning and Weaving.	Other Processes.	Total of Steam Motive Power.
1850 - - -	4,060	1,124	4,387	198	9,769
1856 - - - -	4,845	1,450	6,479	408	13,182
1861 - - -	8,958	2,421	13,368	679	25,426
1868 - - - -	19,199	4,445	19,316	456	43,416

From these returns we see that the total horse-power produced by steam used in the manufacture of woollen and worsted amounted together to 22,336 in 1850, and that it increased in 1868 to 78,296; showing an increase of 55,960 horse-power in the eighteen years.

Regarding the general arrangements for burning coal in 1850 as being less perfect than they were in 1868, we cannot estimate the consumption of coal at that time as less,—that on the average of all the engines used,—than nine pounds of coal per horse-power per hour. This will give a consumption of coal in 1850 in our worsted and woollen manufactures of not less than 323,074 tons. If the consumption of the coal in 1868 had continued at the same rate, the coal consumed would have been not less than 1,132,495 tons; but some economy has certainly been introduced in that period, and, notwithstanding the waste of fuel which still unfortunately continues, we may consider that the power has recently been produced by an expenditure of coal equal to a little less than 8 lbs. per horse-power per hour. This would reduce the coal used in 1868 for the woollen and worsted manufactures to 1,006,663 tons.†

* In 1868, in addition to the spinning spindles used in 1868, there were 2,215,231 doubling spindles used in cotton factories, 167,038 used in woollen factories, 348,363 in worsted factories, 181,538 in silk factories, 55,789 in flax factories, 870 in hemp factories, 2,400 in jute factories, 4,228 in shoddy factories, and 540 in elastic factories; total 2,975,997.

† The following summary of the state of the woollen and worsted manufactures appeared in the Times of Sept. 9, 1870. It shows so fully the condition of the trade, that no excuse is required for quoting it:—

"Seats of the Woollen Trade.—The woollen trade is found in 32 of the 52 counties of England and Wales, but in some to a very small extent. In 1868 17 of the 40 counties of England had more than 100 of their population employed in woollen manufactures, 6 of the 12 counties in Wales, 16 of the 33 counties of Scotland, 6 of the 32 counties of Ireland. The chief homes of the trade, however, are fewer. Yorkshire heads the list, with 27,548 of its people employed in the woollen trade in 1839, and 59,602

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SCOTLAND. In SCOTLAND we find in 1850 there were 182 factories, in 1861 184, and in 1868 187, or an increase of five woollen factories over the earliest period given. The worsted factories were in 1850 only 6, in 1861 17, and they fell back to 14 in 1868. The spinning spindles and power looms were:—

—	WOOLLEN.		WORSTED.	
	Spinning Spindles.	Power Looms	Spinning Spindles.	Power Looms.
1850 - -	224,129	247	9,404	—
1856 - - -	272,225	665	21,137	135
1861 - -	317,185	1,303	38,946	80
1868 - - -	343,068	3,418	42,178	110

The steam power required for this spinning and weaving of woollen goods was in Scotland, as follows:—

—	Spinning.	Weaving.	Spinning and Weaving.	Other Processes.	Total of Steam Motive Power.
1850 - -	729	6	145	—	880
1856 - -	708	20	453	16	1,197
1861 - -	544	92	942	—	1,578
1868 - -	783	299	2,546	50	3,678

The amount of steam produced, horse-power employed, had increased from 1850 to the extent of 2,898 horses, which would imply a consumption of coal in the woollen manufacture of Scotland amounting to 47,280 tons at 8 lbs. per horse-power per hour, or 53,155 at 9 lbs., which is thought to be nearer the actual consumption.

In worsted manufacture we find as follows:—

—	Spinning.	Weaving.	Spinning and Weaving.	Total of Steam Motive Power.
1850 - -	121	—	—	121
1856 - -	255	35	—	290
1861 - -	533	50	225	808
1868 - -	1,072	83	—	1,155

The increase, therefore, in the worsted manufacture of Scotland, since 1850, amounts to 1,034 horse-power, the consumption of coal at 9 lbs. per horse-power per hour being 16,706 tons.

	Tons.
Woollen manufacture used - -	53,155
Worsted ditto - - -	16,706
Total coal - -	69,861

in 1868; Lancashire gave 4,947 people to the trade in 1839, and 11,338 in 1868; Cheshire, 174 in 1839, 6,045 in 1868; Derbyshire, 35 in 1839, 4,668 in 1868; Leicestershire, 85 in 1850, 2,077 in 1868; Gloucestershire, 5,515 in 1839, 6,368 in 1868; Wilts, 3,218 in 1839, 3,192 in 1868; Somerset, 2,133 in 1839, 2,518 in 1868. In Scotland, Selkirk shows 406 persons in the woollen factories in 1839, 2,696 in 1868; Stirling, 327 in 1839, 1,889 in 1868; Clackmannan, 1,083 in 1839, 1,845 in 1868; Roxburgh, 640 in 1839, 1,780 in 1868; Dumfries, 78 in 1839, 1,238 in 1868; Aberdeen, 1,083 in 1839, 1,027 in 1868. In Ireland, Dublin county had 580 persons in this employment in 1839, 9,304 in 1868. The great progress of the woollen trade will be seen from the following statistics:—In Yorkshire there were in 1861 1,296,190 spinning spindles, 11,405 power looms, amount of moving (horse) power 19,634 steam and 2,816 water; in 1868 1,842,690 spinning spindles, 20,028 power looms, moving power, 21,029 steam and 2,774 water. In Lancashire there were in 1861 277,655 spinning spindles, 6,377 power looms, moving power, 2,121 steam and 337 water; in 1868 1,842,730 spinning spindles, 7,581 power looms, moving power, 3,171 steam and 591 water. In Cheshire there were 7,828 spinning spindles in 1861, 406,788 in 1868; in Derbyshire, 11,928 in 1861, 330,750 in 1868; in Leicestershire, 6,360 in 1861, 43,948 in 1868; in Gloucestershire, 59,986 in 1861, 65,094 in 1868; in Wilts, 44,825 in 1861, 43,607 in 1868; in Somerset, 31,401 in 1861, 40,469 in 1868; in Selkirk, 46,368 in 1861, 65,046 in 1868; in Clackmannan, 38,311 in 1861, 62,116 in 1868; in Roxburgh, 60,747 in 1861, 54,154 in 1868; in Stirling, 32,950 in 1861, 44,171 in 1868; in Dublin, 6,636 in 1861, 6,020 in 1868; in Cork, 2,752 in 1861, 6,410 in 1868. The result for the United Kingdom is 54,918 persons employed in woollen factories in 1839; 86,983 in 1861; 127,181 in 1868; 2,182,609 spinning spindles in 1861, 4,189,560 in 1868; 21,770 power looms in 1861, 46,204 in 1868; moving power in 1861, 26,879 steam and 9,598 water; in 1868, 42,633 steam and 11,229 water. The progress of the worsted trade has been equally remarkable. In 1839 it employed in the United Kingdom 34,363 persons; in 1861 86,063; in 1868 131,896. It is found more or less in ten counties of England, six of Scotland, two of Ireland; but Yorkshire is well known as the great seat of the worsted trade. More than 90 per cent. of the persons employed in the worsted factories of the United Kingdom are employed in Yorkshire. A factory inspector has remarked that within 70 years, the allotted life of man, small manufacturers of worsted goods annually migrated from the neighbourhood of Bradford to the agricultural districts around Wetherby, accompanied by a number of assistant labourers, carrying with them the worsted goods which they had manufactured during the winter season, to dispose of among the wealthy yeomen, whose broad acres of wheat they in turn reaped under contract, and whose wool they bought and carried back to comb, and afterwards to have spun, in the houses of the poor on the borders of Knaresborough Forest. Now all is changed. Yorkshire in 1868 employed 121,117 persons in its worsted factories; had in the trade 2,007,257 spinning spindles, 69,211 power looms, and moving power of 40,899 steam and 1,595 water. These figures, too, show nothing of the increased speed of the spindle and the loom. The worsted factors of the United Kingdom employed 86,063 persons in 1861, 131,896 in 1868; had 1,289,172 spinning spindles in 1861, 2,193,210 in 1868; 43,048 power looms in 1861, 71,666 in 1868; moving power, 26,234 steam and 1 970 water in 1861, 44,571 steam and 2,006 water in 1868. The shoddy manufacture has its home in Yorkshire and Lancashire. It employs 3,187 persons, 73,109 spinning spindles, 995 power looms. The three trades—woollen, worsted, shoddy—gave employment in 1868 to 262,264 persons, with 6,455,879 spinning spindles, and 118,865 power looms, the motive (horse) power amounting to 88,729 steam and 13,365 water."

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In IRELAND we find during the same periods:— IRELAND.

—	Woollen.			Worsted.		
	Number of Factories.	Spinning Spindles.	Power Looms.	Number of Factories.	Spinning Spindles.	Power Looms.
1850 - -	9	14,458	22	2	1,552	—
1856 - -	27	14,798	62	6	5,086	2
1861 - -	39	18,574	123	3	4,700	—
1868 - -	45	23,576	215	2	2,008	—

From this it is evident that there has been a considerable increase in the woollen manufacture, but, since 1856, a considerable decline in the worsted manufacture.

The steam power employed in the woollen trade was very limited, the horse power being as follows:—

—	Spinning.	Weaving.	Spinning and Weaving.	Other Processes.	Total of Steam Motive Power.
1850 - -	8	—	—	—	8
1856 - -	3	—	25	—	28
1861 - -	16	—	52	—	68
1868 - -	—	—	4,075	—	4,075

In the worsted trade a power of three horses only was used in 1856 for spinning, nearly the whole of the work being done by water power. The quantity of coal used in the worsted manufacture in Ireland will be therefore 64,521 tons.

The condition of the woollen and the worsted manufactures of the United Kingdom will therefore be as follows in 1868:— Coal used in woollen and worsted manufacture.

—	Woollen.	Worsted.	Total.	Coal consumed.
	H.P.	H.P.	H.P.	Tons.
England and Wales	34,880	43,416	78,296	1,006,663
Scotland - -	3,678	1,155	4,833	69,861
Ireland - -	4,075	—	4,075	59,388
	42,633	44,571	87,204	1,135,912

COTTON.

The following table shows the actual state of the cotton spinning and weaving establishments using coal for the production of motive power. Cotton.

No. of Factories.—ENGLAND and WALES.

—	Spinning.	Weaving.	Spinning and Weaving.	Other Purposes.	Total.
1850 - -	762	229	540	222	1,753
1856 - -	910	419	623	94	2,046
1861 - -	1,079	722	671	243	2,715
1868 - -	1,041	632	630	102	2,405

No. of Factories.—SCOTLAND.

—	Spinning.	Weaving.	Spinning and Weaving.	Other Purposes.	Total.
1850 - -	166	1	16	—	182
1856 - -	157	1	35	3	196
1861 - -	124	6	54	—	184
1868 - -	52	17	115	3	187

In Ireland the number of factories in the four years given were respectively 2, 6, 3, 2.

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The number of power looms in these factories were,—

In England and Wales.

—	Weaving.	Spinning and Weaving.	Other Processes.	Total Number of Power Looms.
1850	36,544	184,816	2,266	223,626
1856	65,880	209,609	101	275,590
1861	131,554	235,268	1,303	368,125
1868	137,892	206,827	—	344,719

In Scotland.

—	Weaving.	Spinning and Weaving.	Total Number of Power Looms.
1850	14,391	9,173	23,564
1856	12,475	9,149	21,624
1861	16,796	13,314	30,110
1868	20,694	11,170	31,864

Ireland.

—	Weaving.	Spinning and Weaving.	Total Number of Power Looms.
1850	—	2,437	2,437
1856	200	1,433	1,633
1860	296	1,461	1,757
1868	1,812	934	2,746

The number of spinning spindles in these factories were:—

England and Wales.

—	Spinning.	Spinning and Weaving.	Other Processes.	Total Number of Spinning Spindles.
1850	8,685,392	10,055,410	433,167	19,173,969
1856	15,260,777	10,557,799	—	25,818,576
1860	15,077,299	13,274,346	480	28,352,125
1868	14,827,226	15,651,002	—	30,478,228

Scotland.

—	Spinning.	Spinning and Weaving.	Other Processes.	Total Number of Spinning Spindles.
1850	1,163,575	441,994	77,524	1,683,093
1856	1,452,633	588,496	—	2,041,129
1860	1,153,784	690,902	69,712	1,915,398
1868	818,958	575,588	—	1,397,546*

* Exclusive of the number used in one factory in Aberdeen.

Ireland.

—	Spinning.	Spinning and Weaving.	Total Number of Spinning Spindles.
1850	63,800	56,155	119,955
1856	107,108	43,404	150,512
1860	77,876	42,068	119,944
1868	80,576	43,664	124,240

The number of power looms used in these factories were:—

—	England.	Scotland.	Ireland.	Total.
1850	223,626	23,564	2,437	249,627
1856	275,590	21,624	1,633	298,847
1861	368,125	30,110	1,757	399,992
1868	344,719	31,864	2,746	379,329

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* The total amount of steam motive power employed in driving those spindles and working the power looms was as follows:—

——	England.	Scotland.	Ireland.	Total.
	H.P.	H.P.	H.P.	H.P.
1850 - -	62,940	7,712	353	71,005
1856 - -	79,863	7,641	524	88,028
1861 - -	263,136	17,618	909	281,663
1868 - -	171,403	18,509	1,121	191,033

* Steam Power used in Manufactures in Manchester and Salford.—We have been favoured with the following report of a committee of the Manchester Statistical Society, appointed to ascertain the amount of steam power employed in various branches of manufacture in the parliamentary boroughs of Manchester and Salford, 1837–8 :—

Employment of the Reported Horse Power.	Borough of Manchester. Population 1831, 187,022.	Borough of Salford. Population 1831, 50,810.	Total of the Two Boroughs. Population 1831, 237,832.
Cotton spinning and weaving - -	5,272	761	6,036
Bleaching, dyeing, printing - - -	756	521	1,277
Machine makers, foundries, &c. - -	503	226	734
Silk throwing and manufacture - -	237½	104	341½
Cotton, thread, and small wares - -	270	36	306
Collieries - - - - -	106	100	206
Saw mills - - - - -	141	14	155
Engraving for printing calicoes - -	75	6	81
Fustian shearing - - -	46	34	80
Breweries - - - -	16	62	78
Flax spinning - - - -	—	70	70
Chemical works - - - -	55	17	66
Woollen - - - - -	36	22	58
Variously employed, but in no department amounting in the aggregate to 50 horse-power - - - -	408	28	436
Total - -	7,926½	1,998	9,924½

Account of the Number of Steam Engines and Water Wheels, with the Amount of Horse Power, in the Bolton District, taken in February and March 1837. Presented to the Manchester Statistical Society by H. and E. Ashworth.

Turton, April 11, 1837.

SUMMARY.

——	Steam Engines.	Horse Power.	Water Wheels.	Horse Power.
Cotton spinning - - -	90	2,448	18	491
Coal - - - - -	78	878	4	29
Bleaching - - - -	45	780½	17	284
Engineers and iron-founders - -	19	195	1	4
Calico printing - - -	5	131	9	117
Paper making - - - -	14	312	7	204
Machine making - - -	6	95	—	—
Flax spinning - - - -	3	85	—	—
Railway - - - -	4	74	—	—
Power-loom weaving - - -	1	16	1	20
Iron forge - - - -	2	34	—	—
Spindle making - - - -	3	32	—	—
Nail cutting - - - -	1	20	—	—
Corn mills - - - -	2	28	3	22
Silk manufacture - - -	2	8	—	—
Dye works - - - -	1	12	—	—
Chemical works - - -	3	16	—	—
Stone quarries - - - -	2	9	—	—
Churning - - - -	8	11½	—	—
Rolling making - - - -	2	6	—	—
Wood turning - - - -	2	8	—	—
Sizing - - - - -	3	8	—	—
Sawing timber - - - -	1	6	—	—
Bean splitting - - - -	2	9	—	—
Calendering - - - -	1	6	—	—
Coffee grinders - - - -	1	½	—	—
Brewers - - - -	3	13	—	—
Tobacconists - - - -	3	7	—	—
Coachmaking - - - -	1	3	—	—
Total - -	308	5,251½	60	1,171

Steam Power in Salford, Pendleton, Chorlton-upon-Medlock, and Broughton, January 17, 1837.

	Horse Power.	
Water proofing - - - - -	40	
Cotton spinning - - - - -	1,454	
Weaving - - - - - -	298	
Founding, &c. of machines - - - -	258	
Thread and small wares - - - -	134	
Painting, dyeing, &c. - - - -	643	
Chemical works - - - - -	27	
Flax - - - - - -	70	Water Power employed at same time in Pendleton, 90 horse power.
Silk - - - - - -	104	
Woollens - - - - - -	22	
Brewers - - - - -	62	
Fustian shearers - - - - -	34	
Size makers - - - - -	6	
Sizers - - - - - -	6	
Hatters - - - - - -	6	
Marble workers - - - - -	4	
Colliery - - - - - -	100	
Total - -	3,268	

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There was a great increase in the cotton manufacture in 1861, when the quantity of coal consumed in it amounted to 3,612,453 tons. There was between this and 1868 a falling off to the extent of 90,630 tons; consequently the coal used in the production of steam power for this industry in the United Kingdom in 1868 amounted to only 2,456,138 tons.

From the trade circular of Messrs. Ellison and Haywood, of Liverpool, we derive the information contained in the following remarks:—

The import of cotton in 1869 amounted to only 3,382,620 bales, weighing 1,198,354,550 lbs., or 277,510 bales (98,603,380 lbs.) less than in 1868.

The decrease has arisen chiefly from a deficiency in the crops of the United States and of South America. The imports from India exceed those of 1868 by 44,540 bales, and those from the Mediterranean and miscellaneous sources by 30,190 bales. Of this cotton 791,850 bales have been exported to the continent, against 915,120 bales in 1868. This decrease of exports to the continent is not because they are consuming less, but because of the export trade gradually returning to its ante-war channels, and of increased shipments direct to the continent from the cotton-producing countries. The quantity of cotton taken for home consumption during the year has been 2,347,540 bales of 400 lbs. each, against 2,490,490 in 1868, or a decrease of 2,750 bales per week, or 5¾ per cent., and against 2,698,300 in 1860, being a decrease of 6,750 bales per week, or 13 per cent. There are now by the latest official returns 32,000,000 spindles in the kingdom, against 30,000,000 in 1860; so that to give full employment to the spinning power now in existence we should require 55,210 bales of 400 lbs. each per week, instead of 45,140 bales per week last year. From this it appears that our mills were only working 4⅛ days per week on an average during the year 1869.

The consumption of cotton in Great Britain and the various countries of continental Europe in each of the past three years, as compared with the great year 1860, when the largest deliveries on record occurred, was as follows:—

The total into all Europe in 1869 amounted to 4,565,000 bales (averaging 353 lbs. each), of which 3,383,000 were received into British and 1,182,000 into continental ports. Of the 3,383,000 bales into Great Britain, 792,000 bales were re-exported to the continent, making the total supply to foreign Europe 1,974,000 bales, and leaving 2,591,000 for British consumption. The deliveries to English spinners in the year were 2,628,000 bales, and 1,966,000 to continental spinners. In bales of 400 lbs. each the deliveries to spinners were:—

——	1869.	1868.	1867.	1860.
Great Britian -	2,354,000	2,483,750	2,348,250	2,817,250
France - -	607,250	617,000	545,750	674,250
Germany and Holland	530,500	589,000	454,250	438,500
Rest of Continent -	551,250	566,500	528,750	681,750
Total -	4,043,000	4,256,250	3,877,000	4,611,000

The total weight of yarns and manufactures produced in 1869 reached only 817,000,000 lbs., or 5¾ per cent. less than in 1868, when the out-turn amounted to 876,000,000 lbs.; while the average annual production before the cotton famine (1859, 1860, and 1861) was 913,000,000 lbs., a deficiency of about 11 per cent. Of last year's production 85½ per cent. was exported, against 82 per cent. in 1868, 81 per cent. in 1867, and 75½ per cent. for the three years ending 1861. The quantity left for home consumption and stock, therefore, last year, would be only 14½ per cent.; while it was 18 per cent. in 1868, 19 in 1867, and 27½ per cent. in 1861. While the total average woollen goods produced in the four years ending 1861 were 179,698,000 lbs., they had risen in the four years ending 1869 to 241,070,000 lbs.; while the manufacture of linen fabrics in the same time had increased from 169,256,000 lbs. to 232,131,000 lbs. Of these goods, while 73,007,000 lbs. of woollens were taken for home consumption in the former period, 78,572,000 were taken each year of the latter period. The home consumption of linen goods in the same time had increased from 84,666,000 lbs. to 106,848,000 lbs.

The relative production of cotton, woollen, and linen goods during these last four years, as compared with four years ending 1860, has been:—

——	Exported.		Home Consumption.	
	1858–61.	1866–9.	1858–61.	1866–9.
Cotton, per cent. -	77·4	82·7	22·3	17·3
Woollen, „ -	59·3	67·4	40·7	32·6
Linen, „ -	50·0	54·0	50·0	46·0
Total -	71·2	74·7	28·8	25·3

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The woollen figures are exclusive of the shoddy trade, and of the wool derived from slaughtered animals, of which we have no reliable statistics.

This is much to be regretted, because there is reason to believe that the trade in shoddy has greatly increased, and that goods made from it compete a good deal, both at home and abroad, with woollen and cotton fabrics of the coarser descriptions.

SILK.

England and Wales.

Silk.

—	Number of Factories.	Total Number of Spinning Spindles.	Total Number of Power-Looms.	Total Steam Motive Power.	Scotland.	Ireland.
				H.P.	H.P.	H.P.
1850 - -	272	1,188,908	6,092	2,718	140	—
1856 - -	454	1,063,555	9,260	4,238	122	—
1861 - -	761	1,305,910	10,635	5,916	268	2
1868 - -	587	968,182	14,511	5,886	—	11

The silk manufacture of Scotland is small. The return of the total steam-motive power being, in 1850, 140 horse-power; in 1856, 122 horse-power; and in 1861, 268 horse-power. In 1868 there is no return. In Ireland, in 1861, 2 horse-power only were employed in weaving silk; and in 1868, 11 horse-power.

Therefore, in 1861, there will have been used in our silk factories 89,476 tons of coal; and in 1868, when there is a falling off of 174 factories, and a reduction of the coal consumed to the extent of 289 horse-power, the coal used will be 85,296 tons.

FLAX, HEMP, JUTE.

Flax, &c.

—	Flax.				Hemp.	Jute.
	England and Wales. Total Number of Factories.	Scotland. Total Number of Factories.	Ireland. Total Number of Factories.	Total of United Kingdom.	Total of United Kingdom.	Total of United Kingdom.
1850 - -	135	189	69	393	—	—
1856 - - -	139	168	110	417	—	—
1861 - -	136	163	100	399	5	36
1868 - - -	128	134	143	405	26	41

The total number of spinning spindles was:—

—	Flax.				Hemp.	Jute.
	England.	Scotland.	Ireland.	Total of United Kingdom.		
1850 - -	265,568	303,125	396,338	965,031	—	—
1856 - - -	441,759	273,304	567,980	1,288,043	—	—
1861 - -	344,308	279,385	592,981	1,216,674	2,580	32,982
1868 - - -	437,623	256,228	894,273	1,588,124	10,456	80,777

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LINEN MANUFACTURE.

The total number of power-looms being:—

—	Flax.				Hemp.	Jute.
	England.	Scotland.	Ireland.	Total of United Kingdom.		
1850	1,083	2,529	58	3,670	—	—
1856	1,987	5,011	1,691	8,689	—	—
1861	2,160	7,966	4,666	14,792	1	554
1868	5,086	12,985	12,969*	31,040	88	3,508†

* Exclusive of the number of looms used in one factory in Louth.
† Exclusive of the number of looms used in one factory in Antrim.

The steam-power required for moving those was as follows:—

—	Flax.	Hemp.	Jute.
	H.P.	H.P.	H.P.
1850	10,905	—	—
1856	14,387	—	—
1861	31,727	127	2,048
1868	41,548	950	6,891

In 1868 the horse-power employed in the manufacture of flax, hemp, and jute amounted to 49,389. The consumption of coal was, therefore, 714,376 tons.

The following return was furnished to the Royal Commission by the obliging courtesy of Messrs. James Holden and Co., of Belfast:—

RETURN of FLAX SPINNING MILLS in IRELAND, showing COALS consumed.

1st January.	Mills.	Spindles unemployed.	Unemployed.	Total Spindles.	Tons of Coal consumed.
1859	82	560,642	91,230	651,872	116,600
1864	74	641,914	8,860	650,774	133,536
1866	86	759,452	11,362	770,814	157,976
1868	90	841,867	60,439	902,306	175,115
1869	87	631,338	286,000	917,338	131,310

POWER-LOOM LINEN FACTORIES in IRELAND, showing COALS consumed.

On 1st January.	Factories.	Looms employed.	Unemployed.	Total Looms.	Tons of Coal consumed.
1859	28	3,124	509	3,633	10,930
1861	35	4,609	324	4,933	14,830
1864	42	7,929	258	8,187	24,621
1866	44	10,538	266	10,804	32,508
1868	66	11,087	4,130	15,217	33,380
1869	70	10,779	5,434	16,213	32,447

FLAX.

Independently of the coal employed for driving the machinery, a certain quantity of coal is used in preparing the fibre. In the wetting process warm water, steam, and heated air are employed, but the quantity of coal used is small.

In the *scutching* of flax the consumption of coal is very small. A large number of the scutch mills in Ireland are driven by water-power, others combine steam and water-power. In many cases peat and turf are used for fuel, and the *shives*, or woody part of the flax, which comes off the fibre in the process of scutching.

The following abstract of a paper read at the meeting of the British Association at Dundee, by Mr. A. J. Warden, most completely shows the state of the linen manufactures of Dundee, comprehending the flax, jute, and hemp trades. He traced the history of the trade from an early period, and stated that the first spinning mill in the town was erected in 1792. At the end of last century five mills of the aggregate of 60 horse-power, and containing about 2,000 spindles, were in operation. Some of the works were soon stopped, as they were too small, and did not pay. In 1807 there were only four mills in operation, and in 1811 the number was reduced to two. In 1820 the trade began to extend, and by 1822 there were 17 mills of the aggregate of 178 horse-power, and containing 7,944 spindles in operation, in which about 2,000 persons were employed. In 1832 the number had increased to 43 mills, with an aggregate of 724 horse-power. Up to this period flax and hemp were the raw

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materials chiefly used in the manufactures of Dundee. About 1833 a new fibre, jute, began to be introduced into the manufactures of Dundee, and this article had completely changed the character of the trade. Many people, ignorant of its qualifications, were prejudiced against it, but as it became better known it grew in favour, and now the jute manufacture is the great staple of Dundee. After the introduction of jute the extension of spinning machinery became more rapid, and in 1835 the steam-engines in Dundee had increased to 1,023 horse-power. In 1851 1,947 horse-power were employed in Dundee. The Crimean war gave a great impulse to the trade of the district, and additional spinning-mills and many power-loom factories were erected to supply the increased demand consequent thereupon. During the late American war so vast were the requirements of the belligerents on both sides that the machinery then in operation in Dundee was quite inadequate to supply the demand, and many new mills and factories were built, and old ones extended. These additions and extensions were not confined to Dundee, as the entire district shared in the prosperity, and united in the exertions made to increase the production of linens, and satisfying the demand for them. The scarcity and consequent high price of cotton still further increased the consumption of linens, and this also stimulated the erection of new mills and factories. In 1864 there were 61 firms engaged in spinning and weaving by power in Dundee, having 160 steam-engines of 4,621 horse-power, driving 170,552 spindles, and 6,709 power-looms, and employing 36,020 persons. At the present time 72 firms own spinning-mills or power-loom factories, or both, of 5,822 horse-power, containing 202,466 spindles, and 7,992 power-looms. In these works 35,310 persons are employed, and the same firms also employ 6,240 persons in handloom weaving and in other departments, making a total of 41,550 persons employed by them. In addition to these firms there are many manufacturers who have no power-looms, but the number of hand-loom weavers, winders, &c., employed by them, has not been correctly ascertained. There are also many persons engaged in the public calenders and in other auxiliary branches of the trade. The number of these can only be estimated, but the total number of persons directly engaged in the various branches of the linen manufacture in Dundee cannot be much, if at all, short of 60,000. The buildings which have been erected in Dundee for spinning and weaving are most imposing structures, unsurpassed in extent, in durability, and in their proportions by any others. Internally they are furnished with every modern appliance to render them salubrious and healthy, and as the different floors are lofty and the whole thoroughly ventilated, the workers enjoy a degree of comfort unknown to their predecessors. The machinery in the various mills and factories is as perfect and as well adapted for the work it has to perform as human ingenuity and money can make it, and it is invariably kept in the most complete order. Every real improvement is readily taken advantage of as it is discovered, and so humerous and so great are the changes which have been made on both spinning and weaving machinery that in many works the whole of it has been renewed within the last few years. This year the consumption of jute will be about 65,000 tons. Including hemp, the consumption of material in Dundee is at present at the rate of about 90,000 tons a year, and the cost of this material is about two and a half million pounds sterling. In the district of which Dundee is the centre, but excluding Dundee, the average annual consumption of flax and tow for the ten years prior to 1862 was about 25,000 tons. Since then the consumption has largely increased, and it is at present about 37,000 tons of flax and tow, 2,000 of hemp, and 1,000 tons of jute, being in all 40,000 tons, the cost of which is about one and three quarter million pounds sterling. In the entire district, including Dundee, there are now, therefore, about 130,000 tons of flax, hemp, and jute consumed annually, the cost of which is about four and a quarter million pounds sterling. In the district, excluding Dundee, the details of which have already been given, there are 110 firms in the linen trade, employing steam or water power of the aggregate of 6,290 horse-power, driving 191,452 spindles and 10,151 power-looms, and employing 28,875 persons. The only way of approximating to the quantity of yarn spun is by multiplying the spindles by the average daily spin of each. This gives a total of about 31,000,000 spindles for Dundee and 29,000,000 for the district, making together 60,000,000 spindles of yarn spun annually, which at the average price of 2*s.* 3*d.* per spindle gives a value of 6,750,000*l.* No reliable estimate of the number of yards of linen made, either in Dundee or in the district, can be formed. Neither is there any mode by which the correct value of the goods made can be ascertained; but it is estimated that the total value of the yarn and linen made in Dundee and throughout the district cannot be under 8,000,000*l.* The capital invested in the spinning-mills and power-loom factories in Dundee is about 2,500,000*l.*, and those in the district 2,200,000*l.*; together, 4,700,000*l.* When the works now in course of erection are completed, which will be within a few months, they will bring up the total cost of the whole to 5,000,000*l.* The amount invested in bleachworks, calenders, and other auxiliary branches of the trade cannot be less than 1,000,000*l.* If to these sums be added the average value of the stock-in-trade in the hands of the spinners, manufacturers, and merchants, it will be within the mark to estimate the capital required to carry on the trade of Dundee and the district around at 10,000,000*l.*

LINEN MANUFACTURE.

The following were the number of factories of spindles and power-looms, and the value of the power employed, in 1868, for working shoddy, horse-hair, felt, elastic, and lace:—

—	Number of Factories.	Number of Spinning Spindles.	Number of Power Looms.	Steam Motive Power.
				H.P.
Shoddy -	104	73,109	995	1,525
Horse Hair -	18	30	46	121
Felt - -	4	—	10	6
Elastic - -	45	3,036	1,443	817
Lace - -	186	—	—	1,257
Total -	357	76,445	2,494	2,726

Consequently, we shall have used in these manufactures 39,473 tons of coal.

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In the manufacture of hosiery in 1868 a steam-power equal to 602 horse was employed.

In the manufacture of our textile fabrics the consumption of coal in 1868 will have been as follows:—

MANUFACTURES.

		Tons.
England and Wales	Woollen and worsted	1,006,663
Scotland	Do. do.	69,861
Ireland	Do. do.	59,388
United Kingdom	Cotton	2,456,138
Do.	Silk	85,296
Do.	Flax, hemp, jute	714,376
Do.	Shoddy, &c.	39,473
Do.	Hosiery	8,707
Total coal used in the textile manufactures of the United Kingdom		4,439,902

The following careful examination of the statistics of textile industry places the whole question in a most satisfactory light:—

"The number of persons employed in the several branches of textile industry in England and Wales in 1868 was 673,334, against 495,707 in 1850, showing an increase of 177,627 hands in the 19 years. The numbers employed in each branch of industry were:—In cotton manufacture, 357,052; woollen, 101,938; worsted, 128,410; silk, 39,956; flax, 21,859; hemp, 1,330; jute, 1,760; hosiery, 6,419; shoddy, 3,187; horsehair, 828; felt, 19; elastic, 3,821; lace, 6,755. Out of the 673,334 hands, 184,904 were employed in spinning; 101,077 in weaving; and 352,287 in spinning and weaving. Of the 184,904 spinners 85,339 were males and 99,565 females; of the former, 16,137 were under 13 years of age; 20,696 were from 13 to 18 years of age; and 48,506 were above 18 years of age. Of the 99,565 females employed in spinning 17,371 were under 13 years of age; and 82,194 were aged 13 and upwards. Of the weavers, 36,818 were males and 64,259 females; of the former, 3,320 were under 13 years of age; 6,717 were from 13 to 18 years of age; and 26,781 were aged 18 years and upwards. Of the 64,259 females employed in weaving 3,607 were under 13 years of age, and 60,652 were aged 13 years and upwards. Of the 352,287 employed in spinning and weaving 139,205 were males, and 213,082 females. In Scotland the number of persons employed in textile manufactures in 1868 was 111,667, against 75,688 in 1850, showing an increase of 35,979. The numbers employed in each branch were:—In cotton manufacture, 39,809; woollen, 14,760; worsted, 3,414; silk, 621; flax, 40,020; hemp, 492; jute, 12,127; hosiery, 141; horsehair, 283. Out of the 111,667 hands, 24,822 were employed in spinning, 30,428 in weaving, and 55,118 in spinning and weaving. Of the spinners 6,828 were males and 17,994 females; of the weavers 5,670 were males and 24,758 females; and of the hands employed spinning and weaving 16,255 were males and 38,933 females. In Ireland the number of hands employed in textile industries in 1868 was 72,963 against 24,687 in 1850, showing an increase of 48,276 hands. The numbers employed in each branch were:—In cotton manufacture, 4,203; woollen, 10,483; worsted, 72; silk, 440; flax, 57,050; hemp, 412; jute, 283; hosiery, 20. Out of the 72,963 hands 29,496 were spinners, 9,025 weavers, and 34,016 were spinners and weavers. Of the spinners 9,704 were males and 19,820 females; of the weavers 2,267 were males and 6,750 females; and of the spinners and weavers 10,535 were males and 23,481 females. The number of factories and the number of hands employed respectively in 1868 in the United Kingdom were as follows:—Cotton, 2,549 and 401,064; woollen, 1,652 and 127,181; worsted, 703 and 131,896; silk, 591 and 41,017; flax, 405 and 118,929; hemp, 26 and 2,234; jute, 41 and 14,170; hosiery, 93 and 6,580; shoddy, 104 and 3,187; elastic, 45 and 3,821; horsehair, 18 and 1,111; lace, 186 and 6,755; and felt, 4 and 19. Total 6,417 and 857,964, against 4,600 and 596,082 in 1850. In the 19 years, therefore, there has been an increase of 1,817 factories and 261,882 hands in connexion with the textile industries of the United Kingdom. The number of spinning spindles during the same period increased from 25,638,716 to 41,516,484; and the number of power-looms from 301,445 to 549,365. The motive horse-power increased from 1850 to 1868 as follows:—Steam, from 108,113 to 337,851; water, from 26,104 to 29,830.

The following table, showing the condition of the cotton trade at Preston in 1869–70, may be referred to as an example of the irregularities attending this particular industry.

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The Cotton Trade at Preston.

The subjoined return from Mr. John Sharples, Secretary to the Power-loom Weavers' Association, exhibits the state of the weaving department, giving the total number of looms in the town, the number working four and six days per week, and the number stopped:—

Firm.	Number of Looms.	Working four days.	Working six days.	Stopped.
Arkwright, D.	606	606	—	—
Birley, Bros.	750	—	440	310
Brazil, C.	276	—	196	80*
Calvert, W.	540	540	—	—
Calvert, Messrs.	1,390	1,390	—	—
Clayton and Sons	186	—	—	186
Dawson, W.	500	—	—	500†
Gardner and Welch	560	—	500	—*
Gardner, E. T. (assignees)	190	—	—	190
Gardner, R., Kay Street	615	—	540	75
Do., New shed	400	—	400	—
Goodair, J., Brookfield	519	—	360	159
Do., Peel Hall	870	—	600	270
Goodair, R.	672	—	672	—
Hague and Penny	620	—	620	—
Hawkins and Sons, Adelphi Street	960	960	—	—*
Do., St. Paul's Road	300	300	—	—
Heywood, Mr.	212	—	212	—*
Hollins, E.	840	—	—	840‡
Horrockses, Miller, and Co., Yard Mill	1,600	—	1,600	—
Do., New Hall Lane	1,000	—	1,000	—
Humber, J., and Son	690	—	690	—
Horrocks, Jacson, and Co.	86	—	—	86
Huntington and Co.	160	—	100	50
Irvin, Mr.	180	—	80	100§
Jackson, R. and W. (assignees)	960	—	—	960
Lancaster and Isherwood	560	—	560	—*
Do., St. Paul's Road	310	—	160	150*
Leigh, J. and A.	1,040	—	880	160
Leese, S. and J. F.	568	—	370	198
Marsden, Mr.	180	110	—	80
Napier, G. W. and Co.	564	—	564	—
Naylor, J. (assignees)	340	—	—	340
Outram, J., New Hall-lane	570	—	570	—
Do., Castle Street	400	—	320	30‖
Paley, J.	287	—	287	—¶
Paley, Rawsthorn, and Co.	160	—	160	—
Rattray and Simpson	335	—	167	168
Simpson, J. A., and Co.	880	—	880	—
Smith, G. (assignees)	420	—	—	420
Smith and Grime	640	—	350	290
Swainson, Birley, and Co.	1,420	—	1,420	—
Swainson, J., Leighton Street	480	—	—	480†
Do., Steam Mill	612	—	—	612†
Swainson, E.	530	—	502	28*
Shaw, H. and Co.	420	—	200	220
Sharples, Mr.	480	—	480	—
Slater, Mr.	500	—	—	500
Thom and Co.	600	—	—	—§
Threlfall, R. and R. G.	630	—	—	630
Threlfall, J., and Son	816	—	816	—
Todd, Mr.	160	—	90	70
Williamson's executors	714	—	714	—*
Wilding, New Hall-lane	470	—	410	60
Do., Alexander Mill	532	—	532	—*
Ward, Mr.	150	—	70	80
Woods and Hampson	440	—	440	—
Do., Lancaster Road	118	—	118	—

* Waiting for beams.
† Stopped 2½ years.
‡ Closed 2½ years. Failed.
§ Working up for closing.
‖ Waiting for weft.
¶ Waiting for healds.

The figures show that there are 32,008 looms in Preston, of which number about 4,000 are running only four days per week; nearly 19,000 are working full time, though some of the weavers are kept standing much of their time waiting for "beams" (yarn), and nearly 9,000 are wholly stopped. Taking the trade average of 2½ looms to each weaver, that number (9,000) would give employment to 3,600 hands. Thus, the whole of the machinery now lying idle in Preston would, if running, find work for 5,000 operatives in both branches of the cotton trade. Mr. Hermon (Horrockses, Miller, and Co.) has purchased the mill recently occupied by Mr. H. Seed, and is now putting in 740 looms, which will no doubt be started at once when completed.

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Coal used in the Production of Steam Power, and for the General Purposes of Manufacture in the United Kingdom.

Of those Countries and Chief Towns numbered detailed Returns will be found in the Appendix.

Number.	Counties, and some Chief Towns.	Steam Engines.		Horse Power returned.		Coal used for Steam Power.			Coal used for other Purposes.			Total of Coal used for all Purposes.
		Number returned in use.	Number estimated.	Nominal.	Indicated.	Returned.	Estimated.	Total.	Coal and Coke, computed as Coal returned.	Coal and Coke, estimated.	Total.	
						Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	Bedfordshire*	—	55	—	—	—	27,500	27,500	—	12,470	12,470	39,970
	Berkshire†	—	78	—	—	—	26,300	26,300	—	15,500	15,500	41,800
	Buckinghamshire‡	—	45	—	—	—	13,500	13,500	—	25,000	25,000	38,500
	Cambridgeshire	—	60	—	—	—	14,750	14,750	—	14,500	14,500	29,250
1	Cheshire	530	300	11,172½	31,150	218,022	129,000	347,022	62,133	61,000	123,133	470,155
	Cornwall (*Mines Return separate*)	—	150	—	—	—	—	—	—	11,150	11,150	11,150
2	Cumberland	86	40	1,352	3,065	38,823	17,500	56,323	15,403	11,475	26,878	82,201
3	Derbyshire	319	400	7,058	7,329	162,284	214,000	376,284	340,494	333,412	673,906	1,050,190
	Devonshire§ (*Mines Return separate*)	—	—	—	—	—	—	—	—	20,000	20,000	45,000
4	Plymouth	58	10	593	—	13,339	950	14,289	4,981	—	—	—
	Dorsetshire‖	—	44	—	—	—	7,750	—	—	6,500	6,500	14,250
5	Durham	110	90	894	—	70,158	54,500	124,658	264,524	156,000	420,524	545,182
6	Essex	69	55	580	591	14,919	12,750	27,669	23,150	25,000	48,150	75,828
7	Gloucestershire	48	165	—	—	28,199	10,500	38,699	15,340	3,500	19,040	57,739
8	Bristol	99	50	1,489	4,211	73,067	58,262	131,329	57,275	142,786	200,061	331,390
	Hampshire¶	—	125	—	—	—	18,750	18,750	—	14,750	14,750	33,500
	Herefordshire**	—	35	—	—	—	6,250	6,250	—	35,000	35,000	41,250
9	Hertfordshire	—	25	256	12	4,070	4,500	8,570	6,554	5,750	12,304	20,874
	Huntingdonshire	—	15	—	—	—	3,000	3,000	—	2,550	2,550	6,550
10	Kent	140	100	1,625	1,509	23,721	20,000	43,721	63,483	50,000	113,483	157,204
11	Lancashire	2,633	1,907	51,496	119,568	1,535,471	1,144,200	2,679,671	570,127	407,500	977,627	3,657,298
12	Manchester	2,655	390	71,134	163,992	2,065,345	351,000	2,416,345	520,690	420,000	940,690	3,357,035
13	Liverpool	454	200	5,271	4,956	255,079	25,750	280,829	190,418	97,500	287,918	568,746
14	Leicestershire and Rutland	108	100	1,579½	1,201	34,089	35,000	69,089	14,102	13,000	26,427	96,190
15	Lincolnshire	55	70	548	287	6,597	6,500	12,897	11,976	7,750	19,726	32,623
16	Middlesex	51	10	600	248	12,023	2,000	14,023	7,885	16,800	24,685	38,708
17	London	979	270	16,780	613¼	425,106	135,000	560,106	667,213	175,000	842,213	1,402,319
	Norfolk	—	60	—	—	—	—	5,000	—	12,500	12,500	17,500
	Northamptonshire††	—	64	—	—	—	—	6,450	—	15,750	15,750	21,200

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18	Northumberland	75	50	112	—	26,344	15,500	41,844	65,407	45,750	111,157	153,025
19	Newcastle	101	57	130	2,702	77,057	56,750	133,807	838,154	65,500	859,654	1,037,461
20	Nottinghamshire	178	150	2,253	1,744	60,284	45,000	105,284	37,137	19,600	56,737	162,021
	Oxfordshire ‡‡	—	35	—	—	—	7,000	7,000	—	5,650	5,650	12,650
21	Shropshire	26	45	135	157	3,310	6,000	9,310	11,489	6,450	17,939	27,149
22	Staffordshire	532	250	7,906	4,841	211,334	111,250	323,084	447,261	545,000	992,261	1,315,345
23	Potteries	70	45	1,071	528	54,097	27,000	81,097	451,393	24,300	478,993	560,090
24	Birmingham	734	—	6,623 HP.	3,287 LP.	—	409,200	409,200	—	182,400	182,400	591,600
	Suffolk	—	15	—	—	—	3,750	3,750	—	6,700	6,700	10,450
25	Surrey	68	60	700	245	10,135	7,250	17,375	30,022	25,500	55,522	72,899
26	Sussex	34	55	179	154	3,338	6,500	9,838	3,729	5,000	8,729	18,567
27	Warwickshire	99	90	891	4,124	45,924	43,750	89,674	20,528	11,400	31,928	121,602
	Westmoreland §§	—	15	—	—	—	3,000	3,000	—	3,250	3,250	6,250
28	Worcestershire	112	—	1,354	2,830	138,563	60,750	199,313	60,975	48,450	109,425	308,738
	Wiltshire |||	—	47	—	—	—	82,500	82,500	—	7,500	7,500	90,000
29	Wales, North	39	50	350	105	9,667	12,750	22,417	63,200	25,000	88,200	110,617
30	Wales, South	102	100	607	232	14,317	16,750	31,067	58,542	67,500	126,042	157,109
31	Yorkshire, North and East Ridings	99	100	1,495	1,510	31,226	35,000	66,226	120,501	30,750	151,251	217,477
32	West Riding	1,897	1,100	36,192	73,727	1,179,013½	605,500	1,784,513½	1,654,436½	760,100	2,414,536½	4,199,050
	TOTAL	—	—	—	—	—	—	10,796,477	—	—	10,739,537	21,476,452

(*) See the returns from the metalliferous mines.

The FACTORY INSPECTORS' RETURNS, and the BOARD OF TRADE, furnish the following Returns in connexion with the Counties estimated.

	Steam produced. Horse Power employed.	Woollen.		Worsted.		Silk.		Flax.	
		Factories.	Spindles.	Factories.	Spindles.	Factories.	Spindles.	Factories.	Spindles.
* Bedfordshire	378	—	—	—	—	—	—	—	—
† Berkshire	494	—	—	—	—	—	—	—	—
‡ Buckinghamshire	616	—	—	—	—	—	—	—	—
§ Devonshire	1,720	17	7,836	2	3,356	1	4,232	3	976
|| Dorset	268	—	—	—	—	—	—	1	812
¶ Hampshire	394	—	—	—	—	—	—	—	—
** Herefordshire	62	2	151	—		4	10,001	—	—
†† Northamptonshire	597	—	—	—	—	—	—	—	—
‡‡ Oxfordshire	314	10	15,049	—	—	—	—	—	—
§§ Westmoreland	267	12	14,636	2	2,106	—	—	2	320
||| Wiltshire	773	25	43,607	—	—	2	5,888	—	—

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SCOTLAND.

Summary from Tables in Appendix.

Scotland.	Circulars.		Steam Power.		Other Purposes.		Total.	Remarks.
	Returns received.	Works estimated.	Coal returned.	Coal and Coke estimated.	Coal returned.	Coal and Coke estimated.	Returned and estimated.	
				Tons.	Tons.	Tons.	Tons.	
1. Aberdeen	49	45	19,129		6,264			—
2. Argyleshire	17	8	3,335	27,500	9,403	17,550	94,503	—
3. Ayrshire	26	25	7,387		3,042			—
4. Banffshire	3	2	35		4,071			—
5. Kilmarnock	15	17	5,418	3,500	1,054	1,750	14,789	—
6. Berwickshire	8	17	1,349		3,352			—
7. Caithness-shire	4	2	110	75,570	5	24,800	236,149	—
8. Clackmannanshire	42	54	22,889		12,226			—
9. Dumbartonshire	16	9	66,031		30,050			—
10. Edinburghshire	26	23	2,696		6,231			—
11. Dumfries-shire	101	43	67,499	22,500	16,750	37,482	150,887	—
12. Elginshire	9	9	580	32,500	1,176	21,750	139,259	—
13. Fifeshire	115	99	50,517		24,893			—
14. Forfarshire	90	45	51,102		18,008			—
15. Dundee (Forfarshire)	110	80	120,316	94,750	20,331	21,500	333,233	—
16. Haddingtonshire	12	16	4,921		4,469			—
17. Inverness-shire	10	10	1,120		2,235			—
18. Kincardineshire	20	8	759		998			—
19. Kinross-shire	1	7	632	47,500	—	35,750	275,998	—
20. Lanarkshire	66	26	104,231		86,430			—
21. Glasgow (Lanarkshire)	575	—	775,647	—	—	250,000	1,025,647	—
22. Linlithgowshire	33	19	16,235		46,945			—
23. Peebleshire	12	6	2,105	8,750	1,452	20,500	111,794	—
24. Perthshire	60	37	9,377		6,556			—
25. Roxburghshire	20	15	6,595	58,700	1,481	11,500	266,132	—
26. Renfrewshire	70	26	157,977		30,213			—
27. ,, Paisley	78	53	44,759	32,570	21,420	17,700	116,449	—
28. Selkirkshire	19	19	10,299		4,059			—
29. Stirlingshire	46	36	34,499	35,000	2,025	24,718	141,718	—
30. Sutherlandshire	1	5	—		28,678			—
31. Shetland	3	3	90		260			—
32. Wigtonshire	8	5	1,193	750	951	425	3,312	—
Total	1,664	764	1,588,180	439,590	424,080	447,943	10,909,820	

Total number of circulars issued - - - 2,428
" " *returned* - - - 1,664

	Tons.
Coal returned as used for steam engines	1,588,180
" " for other purposes	424,080
Coal *estimated* as used by steam engine, not returned	439,590
" " for other purposes	447,943
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Scotland	3,009,793

IRELAND.

Appendix No. 148, p. 200.

The statement given in the Appendix shows that the total quantity of coal used in the manufactures of Ireland amounted to 846,968.

General Summary of the Returns.

The total returns will be:—

	Tons.
England and Wales	21,476,452
Scotland	3,009,793
Ireland	846,968
Total	25,333,213

See Appendix, Table No. 148 (*a*) for Inspectors' return of Steam Power employed in the Western Division of England and Wales, p. 202.

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SECTION 4.—SALT MANUFACTURE.

The following was the condition of this manufacture in 1869: Salt.

CHESHIRE. Cheshire.

Total quantity of salt made, 1,250,000 tons.

The Quantities of ROCK SALT and WHITE SALT sent down the River Weaver in each of the last Ten Years.

For the Year ending	Rock Salt.	White Salt.	Total.
	Tons of 26 cwt.	Tons.	Tons.
March 31st, 1859	69,528	675,412	744,940
„ 1860	67,563	695,772	763,335
„ 1861	71,043	759,486	830,529
„ 1862	75,011	700,186	775,197
„ 1863	65,136	754,710	819,846
„ 1864	58,030	695,558	753,588
„ 1865	53,000½	670,781½	723,782
„ 1866	48,278	736,775	785,053
„ 1867	50,752	721,423	772,175
„ 1868	49,759	868,679	918,438
„ 1869	58,696	901,566	960,262
„ 1870	67,410	901,158	968,568

The quantity of salt made in Cheshire being 1,250,000 tons.

WORCESTERSHIRE. Worcestershire

	Tons.
DROITWICH	95,000
STOKE PRIOR	100,000
Total	195,000

IRELAND. Ireland.

BELFAST.

The Belfast Salt Mining Company raised 17,472 tons.*

	Tons.
Shipped to Denmark	2,278
„ north of England	6,865
„ east of Scotland	1,506
„ west of Scotland	2,929
„ east of Ireland	682
Manufactured at Belfast	3,212
	17,472
Shipped at BELFAST, salt	18
„ „ rock salt	8,191

SALT exported to FOREIGN COUNTRIES in 1869, as compared with the Two previous Years.

Countries.	Quantities.			Value.		
	1867.	1868.	1869.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	£	£	£
To Russia	72,897	84,903	74,589	46,183	55,429	45,223
„ United States	164,299	155,266	214,828	103,647	91,831	108,391
„ British North America	85,045	80,963	94,598	44,850	42,510	38,830
„ British India	212,347	270,634	240,258	136,610	166,346	118,616
„ Other Countries	189,755	205,137	209,043	114,651	128,963	119,854
Total	724,343	796,903	833,316	445,941	485,079	430,914

* There is now another company raising salt, but no returns have been received.

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It appears that about half a ton of coal, usually that variety known as slack, is used for the production of a ton of salt.

	Tons.
The salt of Cheshire required therefore* - - - -	625,000
That of Droitwich is given by the consumers as - - -	70,000
That of Stoke Prior, Worcestershire† - - - -	75,000
Total used in the salt manufacture -	770,000

SECTION 5.—CHEMICAL AND ALKALI WORKS.

The Statistical Report of the Alkali Trade enables us to state that from 470,000 tons to 500,000 tons of coal are used per annum in the production of soda on the Tyne; this was for the decomposition of 151,700 tons of salt. The Lancashire branch of this trade decomposes about 194,000 tons of salt, using rather more than 580,000 tons of coal; making together 1,082,000 tons of coal in this branch of chemical manufacture.

The following Returns of Manufacturing Chemists are not included in the Summaries of Counties.

Name of Place.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
England - - -	346	156	362	4,437	2,007	198,739	589,092	1,243	—	Steam coal, Clifton Bottom, Burgy, Barnsley, thick coal, Brownhills, Welsh, Burgy, Gloucestershire, Portland, Tanfield, Black Bed, Wigan, Derbyshire, Yorkshire, lump, brown, metal, Bed., Notts, Bristol, Mountain Mine, Lambton Grange, slack.
London - - -	110	49	49	483	446	10,504	16,454	2,774	—	Tanfield, Babbington, Notts, Warwickshire, steam, Derbyshire, hard, steam, smokeless, West Hartley, Welsh, Wallsend and Derby, Silkstone, Victoria, Merthyr steam, Holywell Main.
Scotland - - -	34	25	40	445	348	17,580	42,841	973	—	Berwick, screened coal, splint, hard and soft, Leith, Scotch, Scremerston, Hurlet Main, dross, Tripling, slack.
Total - -	490	230	451	5,365	2,801	226,823	648,387	4,990	—	

	Tons.
Coal returned as used for steam engines in those works - -	226,823
" " for other purposes - - -	648,387
Coke used computed as Coal - - - -	6,653
Total - - - - -	881,863
Coal *estimated* as used by steam engines, not returned - - -	47,006
" " for other purposes " - - - -	150,000
Total Coal used by manufacturing chemists - - -	1,078,863
The quantities given in the Reports of the Alkali Trade contain without doubt some of this coal, but it is not possible to determine how much. We are, after carefully examining the subject, disposed to estimate it at about one half. We have, therefore, to add to the above about - - - - -	500,000
This will give to the chemical works, as above - - - - -	1,578,863
The quantity in the manufacturing returns - - - - -	329,344
Total coal used in chemical manufactories - - -	1,908,207

* The fuel consumed in the salt districts comes by—
a. The River Weaver.
b. The London and North-western Railway.
c. The Trent and Mersey Canal.

† All this is supplied from the Staffordshire coalfield, with the exception of about 15,000 tons, which is received from Leicestershire.

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SECTION VI.—PAPER MANUFACTURE.

Paper.

Circulars were issued to 355 Paper Manufactories, and Returns received from 225 of them. The following are the results:—

Name of Place.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No sent out.	No returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other Purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
England	277	174	531	9,808	7,539	271,764	35,234	—	40	Swansea, steam coal, hard, Radstock, steam coals, Newport, Darwen Yard mine, Yorkshire, Durham, Newcastle, Burgie, Welsh, Staffordshire, Radcliffe colliery, Marehay, hard, Scotch, Newton colliery, Butterley, Helton, Cannel, Wigan, Bolton, Dean Forest, Bushy, Tyne, Cannel, Moira, Longton, Tinsbury, Ruabon, Cannock Chase, Babbington, Derbyshire, Hartley, Wylam, Flint, soft steam, Warwickshire, coke.
Scotland	57	43	120	3,098	2,534	123,365	9,306	—	—	Tyne coal, Newcastle, Fife, steam, Parrott, Gas coal, Wishaw main, Newhalle, soft, Ayrshire, Cannel, Sunderland.
Ireland	21	8	1	16	6	94	1,264	—	—	Newport, South Wales, Red Ash, Welsh, Maryport, Scotch, water power.
Total	355	225	652	12,922	10,079	395,223	45,804	—	40	

Total number of circulars issued - - - - 355
„ „ *returned* - - - 225

Leaving the Coal for 130 works to be estimated.

	Tons.
Coal returned as used for steam engines	395,223
„ „ for other purposes	45,804
Total	441,027
Coal *estimated* as used by steam engines, not returned	155,000
„ „ for other purposes	25,000
Total Coal used in the Manufacture of Paper	621,027

SECTION VII.—TANNING.

Tanning.

Circulars to the extent of 510 were issued to the Tanners of England, with the following results:—

Name of Place.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
London	50	26	30	327	334	5,037	632	890	—	Welsh, Newcastle, Derbyshire, hard, steam, splint steam, inland, anthracite, silkstone.
England	460	305	216	1,789	483	34,558	5,509	551	—	Wallsend, Wigan, Burgy, Forest of Dean, Scotch, Yorkshire, South Durham, Warwickshire, Welsh, Staffordshire, Newcastle, Derbyshire, Radstock, steam, bituminous, Lancashire, Cheshire, silkstone. Spent tan is also largely employed for raising steam, and for drying.
Total	510	331	246	2,116	817	39,595	6,141	1,441	—	

Total number of circulars issued - - - 510
„ „ *returned* - - - 331

Leaving the Coal from 179 works to be estimated.

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	Tons.
Coal returned as used for steam engines	39,595
" " for other purposes	6,141
Coke used computed as Coal	1,921
Total	47,657
Coal *estimated* as used by steam engines, not returned	14,500
" " for other purposes	3,000
Total Coal used by Tanners in England	65,157

SECTION VIII.—COAL USED IN STEAM NAVIGATION.

Steam ships.

The returns given in the Appendix as being received from the 701 steam ships give the quantities of coal used as follows of English coal:—

	Tons.
By steam vessels of England and Wales	1,803,250
By steam vessels of Scotland	356,722
By steam vessels of Ireland	217,095
Total returned	2,377,067

The number remaining to be estimated will be about one quarter of the whole. In this we have been greatly assisted by the polite attention of the officers of Lloyd's. We believe we shall not be greatly in error in giving this as a little short of 600,000 tons of coal.

The following is a return obtained from the Admiralty of the English coal used in the British navy:—

Coals expended by the Admiralty in 1867.

	Steam Coals issued to H.M. Ships and Vessels from Store.		Steam Coals purchased by Ships at various Ports.	Other Fuel.		Coals used for Yard purposes.
		Tons.	Tons.	Patent Fuel.	Local Coals.	Tons.
United Kingdom — Home yards	S.W.	55,474				
	N.C.	9,935				
Haulbowline		4,727	4,389	—	—	71,606
Jersey		657				
Portland		1,079				
Abroad		125,908	27,146	159	146	379

The steam vessel coals issued "from store" both at home and abroad were South Wales coals, except 9,935 tons of north of England coals (N.C.), the use of which description has been discontinued.

The steam coals purchased abroad were chiefly "South Wales" coals originally sent from England.

The coals for yard purposes were for the most part north of England coals.

This will give the total of coal consumed in our naval and merchant steamers as being:—

See Appendix No. 149. for details of coal used by steam vessels, p. 203.

	Tons.
Total returned	2,377,067
Estimated	600,000
Used by the Admiralty	300,505
Total of coal used	3,277,562

The Army.

The various departments of the army use 195,389 tons of coal, as is shown by the following:—

Sir, War Office, 3rd May 1869.

In reply to your letter of the 26th February last, I am directed by Mr. Secretary Cardwell to acquaint you, for the information of the Royal Commissioners on the Supply of Coal, that the average annual consumption of coal purchased by this Department and the produce of pits in the United Kingdom during the two years 1867 and 1868 has been as follows:—

	Tons.
Army, at home and abroad	127,920
Manufacturing establishments	67,469
	195,389

Robert Hunt, Esq., F.R.S.,
&c. &c. &c.,
Royal Coal Commission,
Geological Museum, Jermyn Street.

I am, Sir,
Your obedient servant,
Douglas Galton.

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SECTION 9.—COAL CONSUMED ON RAILWAYS.

Railway Locomotives.

The railways of the United Kingdom now run over 12,803 miles, as shown by the accompanying list compiled from the latest available returns.

England and Wales.

Principal Railways.	Miles.
Blyth and Tyne	38
Bristol and Exeter	134
Cornwall	66
Furness	93
Great Eastern	802
Great Northern	524
Great Western	1,358
Lancashire and Yorkshire	403
London, Brighton, and South Coast	317
London, Chatham, and Dover	135
London and North-western	1,319
London and South-western	602
London, Tilbury, and Southend	44
Manchester, Sheffield, and Lincolnshire	246
Manchester South Junction and Altrincham	9
Metropolitan	5
Midland	831
Monmouthshire	49
North London	12
North-eastern	1,239
North Staffordshire	157
South-eastern	308
South Devon	112
Taff Vale Railway	73
	8,876

Scotland.

Caledonian	682
Glasgow and South-western	254
Great North of Scotland	290
Inverness and Aberdeen Junction or Highland Railway	242
North British	765
	2,233

Ireland.

Belfast and Northern Counties	151
Belfast and County Down	44
Cork, Blackrock, and Passage	6
Dublin and Belfast Junction	63
Dublin and Drogheda	75
Dublin and Kingstown and Dublin, Wicklow, and Wexford	107
Great Southern and Western	437
Irish North-western	195
Midland Great Western of Ireland	344
Ulster	121
Waterford and Limerick	151
	1,694

England and Wales	8,876 miles.
Scotland	2,233 „
Ireland	1,694 „
	12,803 „

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Returns have been obligingly furnished by several of those railways from which the coal used by those not making returns have been computed, the result of this is, that we have determined the quantity of coal used by the locomotive engines to over the nearly 13,000 miles of railway now in action, and for other railway purposes will be as follows:—

	Tons.
Locomotive engines	1,850,000
Fixed engines	27,500
Manufactories, stations, gas, &c.	150,000
	2,027,500

SECTION 10.—GAS MANUFACTURE.

See Appendix, Table 150, p. 205.

Returns have been received from 1,024 works in the United Kingdom, giving the quantity of coal used in them as follows:—

In 1867	3,612,954 tons.
1868	3,811,981 „

Several computations have been made, some of which give the quantity of coal used in gas-making as about one tenth of all the coal raised; this may have been the case when these computations were made, but the rate of consumption in the gasworks or the extension of gas manufacture has not kept pace with the increased production of coal. Therefore the computation made eight or ten years since is of no value at the present time.

A careful examination appears to show that we shall not err to any considerable extent if we compute the coal used in those gasworks, public and private, which have not made returns, at two thousand five hundred tons, and thus give the total quantity of coal used in gas manufacture as 6,311,980 tons.

SECTION 11.—COAL USED AT WATERWORKS IN PUMPING WATER.

Appendix, Table No. 151, p. 207.

Returns to our inquiries have been received from those works only which are named in the table given in the Appendix. Those works used in 1867 112,795 tons, and in 1868 118,712 tons.

Corporations, town clerks, and the like have been applied to. Engineers have also been consulted, several of whom have interested themselves in the inquiry, and the closest approximation to which we can arrive is, that the pump engines of the waterworks of the kingdom use about five hundred thousand tons of coal.

SECTION 12.—MISCELLANEOUS MANUFACTURES AND TRADES.

Under this head we would group bakers, blacksmiths, and the numerous small trades not included in the lists given as using steam power.

STATEMENT IN DETAIL OF THE COAL USED IN 1869.

	Tons.
For pig-iron manufacture	16,337,271
„ merchant iron manufacture	16,109,335
„ tin smelting	22,679
„ copper do.	460,083
„ lead do.	145,299
„ zinc do.	231,170
Coal mines consumption	6,714,222
Metal mines ditto	511,201
For steam navigation	3,277,562
„ army departments	195,000
Railways, locomotives, &c.	2,027,500
For gasworks	6,311,980
„ waterworks, &c.	1,500,000
„ malting	270,000
„ brewing, distilling, &c.	1,692,000
„ china clay works	692,000
„ burning bricks	900,000
„ burning lime	360,000
„ earthenware manufacture	730,000
„ glass making	740,415

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	Tons.
For woollen and worsted manufacture	1,135,912
„ cotton manufacture	2,456,138
„ silk do.	85,296
„ flax do.	714,376
„ shoddy do.	39,473
„ hosiery do.	8,707
„ chemical do.	1,908,207
„ paper do.	621,027
„ tanning	65,157

SUMMARY of the ESTIMATED QUANTITIES of COAL consumed for all Purposes in the United Kingdom.

	Tons.
Pig iron manufacture	16,337,271
Merchant iron and steel manufacture	16,109,335
Tin smelting	22,679
Copper do.	460,083
Lead do.	145,299
Zinc do.	231,170
Coal mines consumption	6,714,222
Metal mines do.	511,201
Manufactures:—	
For steam power, England and Wales	21,470,452
Ditto, Scotland	3,009,793
Ditto, Ireland	846,968
Steam navigation	3,277,562
The army departments	195,000
Railways, locomotives, &c.	2,027,500
Gas manufacture	6,311,980
Waterworks and Miscellaneous	1,500,000
Total	79,170,515
Coal exported in 1869	9,775,470
	88,945,985
DOMESTIC CONSUMPTION	18,481,572
The total quantity of coal raised in 1869	107,427,557

PRICES OF COAL.

There will be found in the Appendix a very full table of the average prices per chaldron of the best coal at the ship's side in the Port of London, and the amount of duty paid to Government, during each month for sixty years from 1805 to 1865; also some interesting details of the prices of coal in the London Market on certain market days in the years 1830 and 1831. We find that the price in London in the year 1635 was 10 shillings per chaldron; in 1653 we find it doubled, being then 20 shillings per chaldron, and in 1795 it was 42 shillings and sixpence per chaldron. In Newcastle in 1655 it was 11 shillings per chaldron. There is also in the Appendix an account of the prices of the various kinds of coal from the different coalfields of the Kingdom.

Appendix, Table No. 152, pp. from 208 to 214.

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CHAPTER VIII.

COAL PRODUCTION OF FOREIGN COUNTRIES.

FRANCE.

Coalfields of France.

The most important coalfields of France are those of the basin of Loire and those of St. Etienne, which are the best known and largest, comprising about 50,000 acres. In this basin are eighteen beds of bituminous coal, and in the immediate neighbourhood several smaller basins containing anthracite. Other valuable localities are in Alsace, several in Burgundy worked by very deep pits, and of considerable extent; some in Auvergne with coal of various qualities; some in Languedoc and Provence with good coal; others at Arveyron; others at Limosin; and some in Normandy. Besides these there are several others of smaller dimensions and less extent, whose resources have not yet been developed. The total area of coal in France has not been ascertained, but is probably not less than 2,000 square miles. But the coal of France is of an inferior description; and therefore, when good and strong coals are required, the supply is still obtained from the English coalfields. The varieties of the mineral combustibles of France were estimated in 1864 by the Government engineers as follows:—

	Tons.
Anthracites	800,000
Hard coal, short flame	1,400,000
Forging coal	600,000
Bituminous coal, long flame	4,000,000
Soft coal, long flame	3,000,000
Lignites	200,000
	10,000,000

It is usual, with French writers, to group the coal basins of France into five fields:—

1. *The coalfield of the north*, an extension of the Belgian basin, which is uncovered from Aix-la-Chapelle to Mons, and which is prolonged in the departments of *Nord* and of *Pas-de-Calais* under the more recent formations.
2. *The coalfields of the east*, the basin of the *Sarre*, which is uncovered in Prussia, and which is prolonged under the secondary rocks of the *Moselle*, and the basin of Ronchamps (*Haute-Saone*).
3. *The coalfields of the west*, including the basin of the *Basse Loire*, and the basin of *La Vende*.
4. *The coalfields of the center.* These embrace the basin of *Saône et Loire* (Blanzy, Creusot, Epinac), the basin of *Allier* (Commentry, Bézenet), numerous lacustrine formations, the principal of which are those of Decize, of Brassac, of Ahun, of Saint Eloi, and the basin of the Loire (Saint Etienne, Rive de Gier).
5. *The coalfields of the south.* The basins of *Aveyron* (Decazeville, Aubin), the basins of *Gard* (Le Grand Combe, Portes, Bessèges), the basin of Carmaux, and the basin of Graissessac.

Appendix, Foreign (1.) p. 215.

The accompanying table in the Appendix, compiled from the official returns of France, shows the number of collieries now worked in France, and also the increase which has taken place since 1847; the number of concessions worked between that year and 1852 being 448, the concessions from that period to 1859 having increased by 42; but from 1859 to 1865 the concessions were increased by 105; of these, however, 47 collieries belonged to Savoy.

The more important increase in the numbers of collieries has taken place in the departments of Aveyron, of Isère, of the Upper Alps, of the Pas-de-Calais, and of Moselle. The production of those collieries will be shown in another table. The iron mines at work, at the latest date of which any authentic return has been published, have been included in this table, as the iron manufacture of France becomes an important element in the question under consideration.

M. Amedee Burat quotes from a report on the coalfields of France in 1852 the following passage:—

"La France peut puiser dans ses propres mines tout les combustibles minéraux qu'elle consomme ou qu'elle est susceptible de consommer; son territoire renferme toutes les qualités de houille qui se recontrent chez nos voisins, bien que cette vérité soit ignorée ou contestée par une partie des consommateurs."

Varieties of coal.

The combustible minerals of France are usually divided into four species, anthracite, coal, lignite, and turf. These are of the following qualities, and are peculiar to the district named:—

1. ANTHRACITE, giving when burnt in close vessels 90 per cent. of fixed residue. This variety is chiefly obtained from the coal mines of Marais (*Allier*), of Lamure (*Isère*), of Bully (*Loire*), &c.
2. ANTHRACITIC COAL, containing from six to seven per cent. of hydrogen and oxygen. This kind is obtained from the mines of Vicoigne, Fresnes, Vieux-Condé (Nord), and from those which work the lower beds of the Belgian coalfield between Charleroi and Namur.
3. "HOUILLES MAIGRES OU DURES À COURTE FLAMME," containing about 10 per cent. of volatile (gaseous) matter, burning with a short flame, and making but little smoke. This is the "houille maigre" of Charleroi, of which the type is taken from the lower beds of the valley of Pieton, of Chatelineau, of the Masse-Saint-François, &c., and amongst the hard coals of the department of Nord.
4. "HOUILLE DEMI-GRASSE," a coal yet more rich in volatile products, burning with a white and clear flame. This kind of coal is obtained in Charleroi, the mines of Mambourg, of Sart-les-Moulins, of Sacrè-madame, of Forehies, &c.
5. "HOUILLE-GRASSE," called "*Maréchale*," and cokeing coal, containing yet more volatile matter than the *demi-grasse*. The cokeing coals of St. Etienne (Loire) are the best type of this variety, which is found with a character more or less decided in nearly all the more extended coal basins of France. It is essentially smith's coal.

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Varieties of coal and lignite.

6. GAS. COAL is a variety of the preceding. It is the *charbon à gaz* of Littes and of Montrambert (Loire), it is "*le flenu*" of Mons. *Houille compacte* or cannel coal belongs to this class.
7. "LA HOUILLE MAIGRE À LONGUE FLAMME." This is more rich in oxygen than any of the preceding varieties. It burns with a long and brilliant flame. It is especially the coal for domestic uses. It is the dominant variety in the mines of Blanzy, of Commentry, of Decazeville, and Sarrebruck.

Of "lignite parfait," of "lignite ligneux," or of turf, no description is required. The first kind of lignite is obtained in the basin of Fuveau in Provence, the second in the Tour-du-Pin in the environs of Chambéry, and at some points of the coast of La Manche.*

According to the Analyses of M. Regnault those varieties of the coals, lignite, and turf of France have the following densities and compositions.

	Density.	Carbon.	Hydrogen.	Oxygen and Nitrogen.
1. Anthracite	1·46	95	2·55	2·45
2. Anthracitic Coal	1·34	92	4·25	3·75
3. Coal Maigre, with short Flame	1·32	90	4·80	5·20
4. Coal Demi-grasse	1·30	87	5·	8·
5. Coal Grasse	1·28	85	5·35	9·65
6. Coal Gas	1·30	85	5·75	9·30
7. Coal Maigre, with long Flame	1·25	78	5·30	16·70
8. Lignite, perfect	1·20	74	5·	21·
9. Lignite, woody	1·	62	5·	33·
10. Turf	0·70	49	6·30	44·70

Of the 12,000,000 tons of coals, the mean average quantity obtained annually in France at the present time, the different varities are produced, according to the authority of Amedee Burat, in the following proportions:—

	Tons.
Anthracite	1,000,000
Anthracitic coal	1,500,000
Coal, grasse, *Maréchales*	1,000,000
„ long flame	3,000,000
„ maigre, long flame	4,000,000
„ ligniteous	1,500,000

The advantages which have been derived from the improvement of the coal industries in the North of France are thus described by one well acquainted with the subject.

He who for some time has not travelled in the North of France, on the road from Lillers to Amiens, would find a pleasing contrast between what that part of the country then was and what it now is; indeed, about ten years ago it was bare and deprived of any industry whatever, whilst at present, besides the numerous manufactures already in existence, day after day new and important works are making their appearance, thus spreading wealth all round. Such a happy change in the features and riches of this district is owing to the discovery of collieries in the Cauchy à la Tour coalfield, bassin houiller du Pas de Calais. Among the mines from which coal is actually extracted, the Coubronne mine is well deserving of public attention; this pit is sunk to the depth of 300 yards. The seams run thus: The Mane, 4-feet seam; the Léon, 3-feet seam; the Juliette, 5-feet seam; the St. Louis, 4-feet seam; and the Du Midi, 3-feet seam; besides two others which have not received special names. The Coubronne mine is capable of yielding about 200 tons per day. The coal is of very good quality, and much in demand for the works in the neighbourhood, as well as for house fuel. Its exceptional situation, in proximity to railways and canals, make it a most valuable property.

The production of coal in France has been steadily increasing. We have some information of value in a "*Statement of the effects which will be produced on the English coal trade by the proposed tax of* 4*s. per ton on coals exported, and reasons for opposing the same.*"† A few extracts from this "Statement" will place the coal production of France in a clear light.

"A reference to the facts connected with the past progress of the French coal trade, as influenced by import and discriminating duties, will fully confirm the opinion that any the slighest tax on coals exported will cut off at once one fourth of our entire exports. * * * In 1788, before the French Revolution, English coals were admitted into France on payment of an import duty of 6*s.* 11*d.* per ton, while Belgian coal was subjected to a duty of 10*s.* 1*d.* per ton. The quantity of English and Belgian coal admitted in 1788 was—

English coal	184,773 tons.
Belgian coal	51,819 „

"After the peace in 1814, and on the opening of the canal of Condé, the French government, with a view to exclude English coal, and favor those of Belgium, placed an import duty of 13*s.* 9*d.* on one, and 2*s.* 9*d.* on the other, which discrimination continued up to the year 1834. During this period the twenty years' average annual imports of English coal into France did not exceed 30,000 tons, while the Belgian coal which entered France has increased from 90,000 tons in 1813 to 620,176 tons in 1834.

"In 1834, simultaneously with the abolition of the export duty in England, the French import duties were remodelled; and the following table will shew with what rapidity the English coal trade

* In *Résumé des Travaux Statisques de l'Administration des Mines*, published by the French Government at somewhat uncertain intervals, will be found the fullest returns of the production of the French mines.

† Printed and circulated in April 1842. Copy preserved in Papers on Collieries and Coal Trade, Mining Record Office.

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has developed itself in France, when freed, on the one hand from the tax on exportation, and on the other by the equalization of import duties.

Coal imported into France.

Quantities of coal, omitting fractions, imported into France from England, Belgium, and Prussia.

	Tons.	Tons.	Tons.
1834 - -	48,000	620,100	78,000
1835 - -	98,000	615,100	89,000
1836 - -	169,500	715,800	113,800
1837 - -	222,600	788,400	132,600
1838* - -	304,600	796,400	125,100
1839 - -	340,300	740,800	156,900
1840 - -	394,900	—	—

Coal produced in France in 1839.

The "Statement" in continuation gives the coal produced from the French coal mines as follows:—

	Tons.		Tons.
1788 - -	225,000	1832 - -	1,962,900
1814 - -	788,300	1833 - -	2,057,600
1825 - -	1,491,400	1834 - -	2,489,800
1826 - -	1,541,000	1835 - -	2,506,400
1827 - -	1,691,100	1836 - -	2,842,000
1828 - -	1,774,100	1837 - -	2,980,700
1829 - -	1,862,700	1838 - -	3,113,300
1830 - -	1,760,400	1839 - -	2,994,900*
1831 - -	No return.		

M. Amédée Burat gives the following statement:—

	Tonne metrical (1,000 killograms, or 19 cwts. 2 qrs. 20 lbs. 10 ozs., or 2,204 lbs. 10 ozs.).
1789 - - -	250,000
1815 - -	950,000
1830 - - -	1,800,000
1843 - -	3,700,000
1857 - - -	7,900,000

This shows at a glance the rapidity of the increase of coal production in France. He continues—"Et deja en 1866 la production atteint 13 millions de tonnes, de telle sorte qu'il y a lieu de penser "qu'en 1870, le chiffre de 15 millions sera franchi, de manière à justifier même une fois cette progres-"sion rapide. On ne peut cependant admettre la continuation indefinie de cette progression. En 1900 "nous arriverions à une production de 60 millions de tonnes, chiffre tout à fait hors de proportion avec "l'étendu, et la richesse de nos terrains houillers."

The following table will, however, place the whole question of the coal consumption of France in a more satisfactory light.

PRODUCTION, IMPORTATION, and CONSUMPTION of COAL of all KINDS in FRANCE from 1787 to 1866.

See Appendix, Foreign (2) for detailed total of imports since 1847, p. 215.

YEARS.	PRODUCTION of COAL in FRANCE since 1787.	QUANTITIES of COALS IMPORTED into FRANCE from					
		BELGIUM.*	PRUSSIA and BAVARIA.†	GREAT BRITAIN.	TOTAL IMPORTS.	DIFFERENCE between IMPORTS and EXPORTS.‡	TOTAL CONSUMPTION in FRANCE.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1787 - -	211,160	49,107	9,821	154,568	213,496	136,117	347,277
1788 - -	220,982	50,893	11,785	181,474	244,152	212,724	433,706
1789 - -	235,714	49,107	9,821	176,785	235,713	206,250	441,954
1802 - -	829,105	86,428	17,678	9,821	113,927	89,375	918,480
1811 - -	759,878	93,303	24,553	..	117,856	88,392	848,270
1816 - -	924,823	267,206	28,973	18,719	314,898	285,135	1,209,960
1821 - -	1,114,448	247,305	41,823	26,041	315,169	242,715	1,357,163
1826 - -	1,513,462	403,278	56,428	36,237	495,943	492,310	2,006,792
1831 - -	1,728,950	435,628	67,694	35,270	538,592	531,674	2,260,624
1836 - -	2,789,858	703,088	111,853	166,462	981,423	955,634	3,745,492
1841 - -	3,349,303	974,507	192,993	422,272	1,589,772	1,550,890	4,899,893
1846 - -	4,389,532	1,326,095	224,336	600,384	2,150,805	2,101,336	6,490,868
1851 - -	4,404,940	1,989,811	292,875	591,377	2,874,063	2,840,160	7,245,100
1856 - -	7,337,741	2,995,619	937,400	1,038,605	4,971,624	4,881,748	12,219,464
1861 - -	9,227,710	3,503,028	1,259,116	1,413,323	6,175,467	5,900,007	15,127,717
1862 - -	10,133,148	3,619,697	1,106,069	1,379,832	6,105,588	5,850,831	15,983,979
1863 - -	10,516,752	3,648,945	1,136,496	1,273,446	6,058,887	5,701,437	16,218,189
1864 - -	11,001,249	3,945,916	1,264,666	1,258,051	6,468,633	6,177,865	17,179,114
1865 - -	11,785,714	4,139,144	1,261,867	1,443,040	6,844,050	6,623,650	18,409,364
1866 - -	11,807,142	4,070,557	1,985,622	1,674,164	7,730,343	7,462,811	19,269,453

* From Mons, Charleroi, Namur, Liège, &c.
† From Sarrebruck and Saint Imbert, Prussia, and Rhenish Bavaria.
‡ This table, and the others in the Appendix, been compiled from the "Statistique de l'Industrie Minerale," which is issued in France about every five years by the Minister of Agriculture, Commerce, and Public Works.
The metrical quintal of the original tables is taken at 220 lbs. avoirdupois, and the English ton at 2,240 lbs.

* Add to tons 15 lbs. to equalize the quintal metre to English weight.
† Dunn, *on the Coal Trade*.—Another return gives 3,133,200 tons as the quantity raised in 1839. The difference arises from the difficulty of correctly converting measures into weights.

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The exports of coals from France are unimportant, the largest export given being 739,354 metrical quintals in 1821; the smallest, 39,182 metrical quintals in 1826. Of late years the exportation has been under 250,000 metrical quintals. This column of differences added to that of production gives the total consumption of the country. Coke has been computed as coal. There is a very small quantity of coal, 696 metrical tons in 1866 received into France, which has not been noted. A detailed table of the coal exports of France will be found in the Appendix, which shows that, small as it has been, it has increased from 52,093 tons in 1847 to 117,940 tons in 1857, and to 336,733 tons in 1864. The largest exportation being to Algiers, Switzerland, Belgium, and Spain.

Export of coal from France.

Appendix, Foreign (3), p. 216.

The rate of increase in the production of coal from the French coalfields has been as follows:—

See Appendix, Foreign (4), p. 217.

Years.	——	Increase.	Decrease.	Another Return gives
	Tons.	Tons.	Tons.	Tons.
1847	5,065,109	—	1,047,234	5,061,183
1848	4,017,875	—	40,531	3,928,996
1849	3,977,344	—	—	3,976,910
1850	4,354,840	377,496	—	4,354,396
1851	4,404,941	50,101	—	4,404,943
1852	4,816,306	411,365	—	4,816,355
1853	5,831,939	1,015,633	—	
1854	6,709,535	877,596	—	
1855	7,317,226	607,691	—	The details of the return
1856	7,784,165	466,939	28,178	for 1852 being—
1857	7,755,987	—	534,720	Loire - - 1,609,912
1858	7,221,267	—	—	Nord - - 1,053,687
1859	7,337,326	116,059	—	Soane et Loire - 518,629
1860	8,155,394	818,068	—	Gard - - 379,114
1861	9,125,040	969,646	—	Allier - - - 251,892
1862	10,102,116	977,076	—	Aveyron - - 179,560
1863*	10,518,406	416,290	—	Sarthe et Mayenne 111,442
1864	11,046,794	528,388	—	Bouches du Rhone 103,616
1865*	11,098,258	51,464	—	
1866	11,785,714	687,456	—	
1867	12,148,223	372,509	—	
1868 }	No returns available.		—	
1869 }			—	

The details of production from 1847 to 1864 are given in the Appendix, in one table distinguishing the principal coal areas, and in the other the coal districts. These are accompanied by a list of the prices of coal and coke in December 1869.

Appendix, Foreign (5), p. 218

Appendix, Foreign (6), p. 219.

BELGIUM.

The Belgian coalfield is the most important in Europe, and occupies two districts, that of Liège and that of Hainault, the former containing 100,000 and the latter 200,000 acres.

Belgium.

1. The western or Hainault division, comprising—
   - *a.* The two basins known as Levant and Couchant of Mons.
     That of Charleroi.
   - *b.* The basin of Namur.
2. The eastern or Liège division.

In each the number of coal seams is very considerable, but the beds are so thin and so much disturbed as to require special modes of working. The quality of coal is various, including one

* Since this period the returns have not been given with their usual exactness. The following return for 1865 was obligingly obtained by M. Lamé Fleury:—

In 1865 the extractions from the coal mines which were of 111,000,000 of quintaux métriques in 1864, seem to have been above 113 millions of quintaux métriques,[a] of which the average price is 1 franc 15 centimes per quintal, and if we remember that in 1860 the extractions were of 83,000,000 of quintaux, it will be perceived that in five years the produce of coal in France has increased by 30,000,000 of quintaux. These numbers are sufficient to show the immense progress which the extraction of mineral fuel has made in our country.

It is not out of place to say, that during that time the prices have remained almost the same. The average price for all France was 1 franc 16 centimes in 1860; it is 1 franc 15 centimes in 1865 (per quintal met.) The reduction of the custom house duties on coal has therefore not lowered the prices, and it could then be said that the consumption has been going on quicker than the production.

We can only give as yet the number approximately for the particular production of certain districts. The whole of the production in 1865 was nearly as follows:—

	Tons.
District of the French north - - -	2,000,000
„ „ Pas-de-Calais - - -	1,400,000
„ „ Gard - - - -	1,215,000
„ „ Loire (St. Etieune) - -	2,500,000
„ „ Bane Loire (Nantes) - -	25,000
Centre district and other districts of France -	4,160,000
	11,300,000[b]

[a] The quintal métrique is equal to 100 kilogrammes, therefore 113,000,000 of quintaux métriques are equal to 11,300,000 French tons.

In France one to 1 equals 10 *quintaux métriques* of 100 kilogrammes by quintal métrique.

[b] I shall be able to give to Mr. Hunt in six weeks the real numbers of 1865, which will not be very differen from these, and I will be able also to give to Mr. Hunt the particular produce of all the districts.

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Coal of Belgium.

peculiar kind, the Flenu coal. It burns rapidly with much flame and smoke, not giving out an intense heat, and having a somewhat disagreeable smell. There are nearly 50 seams of this coal in the Mons district.

Mr. Dunn, formerly H.M. inspector of collieries, reported on the coal of Belgium in 18 , and, first quoting a report which announces that the mines would be exhausted in 20 years, says, "This announcement comes with appalling force upon the numerous joint-stock companies. * * * "According to the report of M. Briavionne, Belgium is traversing towards a momentous crisis; and "I am much inclined to confirm the writer's opinion that, according to the present plan of carrying "on the collieries, notwithstanding the high price received for the coals, yet that coal will not be "found workable to profit below the depth of 250 or 260 fathoms, inasmuch as the deeper they go "the more destructive and unmanageable will be the effects of the pressure."—*The Government Mining Engineer's Report.*

This question has so immediate a bearing on the problem submitted to the Royal Commission that the following reply to the engineer's report is given in full.

This question of the coal inquiry was proposed in 1866 to the provincial council of Hainault, and it was opposed in a report of M. Hardy, the engineer, a report from which we give an extract:—

Duration of coal in Belgium.

"We cannot dispute that in our age the progress, the riches, and the industrial grandeur of a nation depend on the economical conditions by which coal is obtained, but is it useful, above all, is it opportune, to make researches to know, even approximately, the duration of our basins, when science fails in certain data, and the reasoning can only be supported on suppositions which probable one day are contradicted the next. In 1843, M. Gouot, the engineer, wrote that in 20 years Belgium would be exhausted to the depth of 500 metres. The production was then 3,000,000 tons. Twenty-three years have passed since; the extraction has attained 11,000,000 tons, and in Hainaut the mean depth of the pits is only 375 metres. The difference between these predictions and the facts accomplished gives the measure of the errors that science can commit when it is not supported on positive data. As one ought to think, these fatal predictions produce in the industrial world a very lively and very reasonable emotion, which the facts and a more precise knowledge of our basins can only destroy very slowly. Whatever be the extent of our geological knowledge, however complete the study of our coal beds may be, the best followed researches yearly overthrow the best established suppositions, and considerable beds are found where at first only soil barren of coal was met with. Has it not been recently discovered that towards Binche the coal zone extends towards the south under soils of a more ancient formation than coal? It is thus that the limits of our ancient beds are successively enlarging.

"If we consider the question of the expense of extraction, we are obliged to acknowledge that the price of coal will augment according as the pit becomes deeper. In the present state of the science of the miner, it seems difficult to push the work on to the depth of a thousand metres, but necessity will cause researches to be made and means discovered of going beyond this limit, and of maintaining the expense of raising on moderate terms until it is attained. Besides, this augmentation of the price will be one of the best preservatives against prodigality in the use of this combustible. It is certain that for the same reason less coal is consumed now than formerly, but industrial progress has not said its last word. The more the value of coal is augmented the more shall we be forced to use less, and thus its duration will be prolonged until other agents have been discovered to take the immense part that it now fills.

"Without doubt it is given to some one to penetrate profoundly enough into the future to discern what powerful production the progress of science and the discoveries of natural riches can furnish when coal is all abstracted.

"Moreover, several of the coal basins which surround us were not worked till lately, and only now begin to produce. Those of our own country have not ceased to develope themselves.

"The moment, then, does not seem to have come to fear the possible failure of coal. The exhaustion of mines, when it comes, will not be produced suddenly, and useful transformations will be made in a manner so progressive that any shock will be avoided.

"An administrative inquiry on the riches of each grant will give results which, although not precise, will be consulted with eagerness, will cause uneasiness among the stockholders and will excite the manoeuvres of speculation. Each establishment could easily make a like inquiry, leaving a large part unknown, as soon as the coal map in course of execution is finished. The time that will have been given to the perfecting of this work will be a witness to the incomplete knowledge we have of certain parts of our mines; the quantity of information that we shall find there, and which will be the probable if not certain expressions of foreknowledge, will render the proposed inquiry useless."*

One of the most reliable descriptions of the coalfields of Belgium, and the modes of working them, will be found in a memoir by M. Emile Tonneau, read before the Society of Science, Arts, and Letters of Hainault.†

We find numerous statements bearing on the production of coal in Belgium at the beginning of the present century, but little that is reliable before 1851. From that period up to the present the returns are fairly complete. The following tables will show the progress made:—

---

* The reply of M. Hardy, engineer, to the report on the coalfields of Belgium (coal engineering) in 1866, of the Provincial Council of Hainault.

† De L'Exploitation de la Houille en Belgique. Description and comparison au pointe de vue économique des divers modes d'exploitation proprement dite employés dans les différents centres houillers de la Belgique, par Emile Tonneau, ingénieur de charbonnage.

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Coal raised in Belgium and exported.

Export of coal.

Years.	Produced.	Exported.
	Tons.	Tons.
1831	2,270,000	468,000
1832	2,449,000	1,287,000
1833	2,708,000	576,000
1834	2,747,000	654,000
1835	2,902,000	685,000
1836	3,143,000	761,000
1837	3,263,650	789,000
1838	3,685,402	775,000
1839	2,812,256	—

Years.	Coal.	Years.	Coal.
	Tons.		Tons.
1851	6,122,204	1857	8,234,190
1852	6,673,910	1858	8,776,326
1853	7,044,604	1859	8,997,118
1854	7,305,818	1860	9,439,272
1855	8,259,139	1861	9,877,571
1856	8,065,769	1862	9,758,223

Showing an increase in the annual production since 1851 of 3,755,367 tons. The increase is still more strikingly shown by comparing the years since 1836.

Produce of the respective Provinces in the Years.

Province.	1836.	1851.	1860.	1862.
	Tons.	Tons.	Tons.	Tons.
Hainault	2,307,622	4,668,308	7,373,654	9,655,971
Namur	77,760	184,503	200,875	242,098
Luxembourg	—	367	—	—
Liege	616,704	1,269,026	1,864,743	1,860,154
Total	3,002,086	6,122,204	9,439,272	9,758,223
Increase	—	3,120,118	3,317,068	318,951

The production of coal in the province of Hainault is the most important, and fortunately we have reliable returns from the year 1845, as follows:— Hainault coal.

Years.	Product in Metrical Tons, 2,200 Lbs.	Cost Price.	Selling Price.	Profit per Tonne.
		Frs. c.	Frs. c.	Frs. c.
1845	3,670,484	8 53	10 0	1 47
1846	3,798,335	8 73	9 41	0 68
1847	4,201,531	8 77	9 11	0 34
1848	3,654,741	7 96	8 56	0 60
1849	4,018,195	6 96	7 63	0 67
1850	4,420,761	7 05	8 31	1 26
1851	4,753,186	7 17	8 26	1 09
1852	5,234,646	7 06	8 06	1 0
1853	5,482,771	7 57	8 72	1 15
1854	6,154,860	8 95	10 82	1 87
1855	6,458,416	10 39	12 78	2 39
1856	6,219,132	11 16	13 46	2 30
1857	6,441,182	10 61	12 42	1 81
1858	6,855,011	10 42	12 0	1 58
1859	7,099,326	10 61	11 80	1 19
1860	7,506,720	10 21	11 56	1 35
1861	7,935,645	10 09	11 22	1 14
1862	7,795,170	9 90	10 78	0 88
1863	8,101,102	9 62	10 41	0 79
1864	8,670,372	9 15	10 17	1 02
1865	9,206,058	9 41	10 69	1 28
1866	9,851,424	10 26	12 23	1 97
1867	9,595,280	11 14	12 88	1 74

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Collieries in Belgium.

The Number of Collieries in activity from 1859 to 1867 have been as follows:—

——	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
Hainault - -	92	89	92	86	87	88	82	82	86
Namur - -	22	24	21	20	23	21	21	22	22
Luxembourg - -	—	—	—	—	—	—	—	—	—
Liége - -	81	79	80	74	72	68	65	51	67
Total - -	195	192	193	180	182	177	168	155	175

The Number of Collieries at work and the Quantity of Coal raised in Belgium since 1859, in English statute tons.

Province.	1859. Coal raised.	1860. Coal raised.	1861. Coal raised.	1862. Coal raised.	1863. Coal raised.	1864. Coal raised.	1865. Coal raised.	1866. Coal raised.	1867. Coal raised
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Hainault - - -	6,972,552	7,373,653	7,793,937	7,655,970	7,956,439	8,515,543	9,041,664	9,675,505	9,439,935
Namur - - -	216,906	200,875	238,720	242,098	251,101	261,480	300,274	352,231	333,639
Luxemburg - - - -	—	—	—	—	—	—	—	—	—
Liége - - - -	1,807,659	1,864,742	1,844,913	1,860,154	1,953,050	2,182,055	2,287,225	2,518,755	2,721,474
The total of the Kingdom -	8,997,117	9,439,270	9,877,570	9,758,222	10,160,590	10,959,078	11,629,163	12,546,541	12,544,638

The Quantities of Coal of different Qualities raised in Belgium.*

——	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1st.—Houille Maigre, Lean Coal. Burning nearly without flame.									
Picked large - - -	8,399	2,068	3,341	5,260	3,244	1,554	2,058	51,837	
Medium - - -	577,728	624,551	684,083	634,740	689,272	697,585	806,194	721,426	
Small - - - -	92,954	43,897	25,121	38,531	37,385	36,245	39,573	165,447	
2nd.—Houille Sèche, Dry Coal. Short Flame.									
Large - - -	120,489	150,944	149,904	170,933	169,547	178,789	211,258	165,883	
Small - - -	538,218	627,649	682,147	660,589	633,099	707,093	726,461	618,258	
3rd.—Houille Maigre, Lean Coal. Long Flame.									
Large or Medium - -	184,100	197,607	82,185	68,515	56,964	48,242	59,533	48,709	
Medium Small - -	327,927	334,812	243,979	205,150	207,075	202,502	186,096	185,226	
Small - - -	1,377,117	1,240,220	1,654,979	1,465,288	1,608,347	1,804,834	1,946,624	2,140,596	
4th.—Houille Grasse, Fat Coal. Long Flame.									
Large - - -	295,486	334,097	312,503	387,690	453,612	464,012	545,929	499,244	
Small or Coke - -	3,617,618	3,856,495	4,014,090	3,913,208	3,992,559	4,321,210	4,404,922	4,289,365	
5th.—Houille Grasse Maréchale, Smiths' Coal.									
Large - - -	44,184	48,832	40,258	43,812	41,329	39,709	50,568	49,306	
Small or Coke - -	1,808,072	1,978,094	1,984,977	2,164,505	2,269,204	2,486,385	2,649,978	3,611,238	

* The coal of Belgium is divided commercially into the following qualities. *Maigre*, Seam Coal; *Sèche*, Dry Coal; and *Grasse*, Fat Coal. These kinds are again divided into *Gros*, picked large coal; *Tout Venant*, the remainder after the selection of the *Gros*, equivalent to "through and through" coal; *Gaillette*, smaller than the *Gros*, but not less than six inches square; *Menu*, coal which passes through a sieve with 1¼-inch meshes; *Gailletterie*, the coal which remains after the separation of the *Gaillette* and *Menu*.

The following table has been constructed from a series of tables by M. Vuillemin, as published by M. Amédée Burat for the committee of coal owners in France. From it we obtain a very satisfactory view of the French and Belgian coal produce.

Bassin du Nord.

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	1,845,544	20,788,077	11.26
1865	2,047,782	24,311,133	11.87
1866	2,229,463	28,477,512	12.77
1867	2,316,546	31,539,241	13.61
Mean	2,109,834	26,278,991	12.45

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Coal produced in Belgium.

Bassin du Pas-de-Calais.

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	1,276,193	15,484,554	12.13
1865	1,399,850	16,828,712	12.
1866	1,602,693	21,749,619	13.50
1867	1,612,196	24,273,393	15.
Mean	1,472,733	19,584,069	13.29

Bassin de Mons.

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	3,453,345	36,605,357	10.60
1865	3,584,598	—	—
1866	3,763,362	48,287,000	12.83
1867	3,523,270	49,316,200	13.90
Mean	3,581,211	—	—

Bassin du Centre.

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	1,394,737	15,983,686	11.46
1865	1,503,160	—	—
1866	2,417,602	30,075,460	12.44
1867	2,426,110	31,255,350	12.88
Mean	1,935,402	—	—

Bassin de Charleroi.

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	3,822,290	38,872,269	10.17
1865	4,118,300	—	—
1866	3,670,190	42,145,170	11.48
1867	3,645,900	43,050,550	11.80
Mean	3,814,170	—	—

Bassins du Hainaut (Mons, Centre, et Charleroi reunis).

Years.	Metrical Tons, 2,200 Lbs.	Total Value in Francs.	Value per Tonne in Francs.
1864	8,650,732	91,461,312	10.54
1865	9,206,058	98,397,000	10.69
1866	9,851,424	120,507,630	12.23
1867	9,595,280	123,619,100	12.88
Mean	9,330,780	108,476,260	11.62

Export of Belgium coal.

Countries to which the Coal of Belgium is exported.

——	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
France - - -	Tons. 2,934,891	Tons. 3,259,394	Tons. 3,160,687	Tons. 2,694,032	Tons. 2,689,834	Tons. 3,993,832	Tons. 3,290,947	Tons. 3,818,712	Tons. 3,442,416
Pays Bas - - -	145,411	141,512	148,011	135,162	142,198	155,890	190,894	137,754	108,727
Prussia* - - -	—	3,107	3,323	2,948	2,696	2,039	2,854	4,705	2,961
Grand Duchy of Luxemburg* -	—	1,778	5,126	973	1,575	2,412	3,294	1,917	3,523
Other places† - - -	8,768	2,901	6,563	7,222	3,045	9,970	15,989	8,684	6,661
Total - -	3,089,070	3,388,692	3,318,710	2,840,337	2,839,348	3,264,243	3,503,978	3,971,772	3,564,308

* Not distinguished in 1859.
† Amongst the other places we find included England, Spain, Russia, Hans Towns, Switzerland, Turkey, United States, and Brasil.

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Coal of Belgium.

Production, Home Consumption, and Exportation of the Coal of Belgium.

——	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Production - - -	8,997,117	9,439,270	9,877,570	9,755,222	10,160,590	10,959,078	11,629,163	12,546,541	12,544,033
Home consumption - -	5,908,047	6,050,578	6,558,860	6,917,885	7,321,242	7,694,835	8,125,185	8,645,696	9,043,223
Exportation - - -	3,089,070	3,388,692	3,318,710	2,840,337	2,839,348	3,264,243	3,503,978	3,971,772	3,564,366

Our Board of Trade in 1868 commenced the publication of Trade Accounts of Foreign Countries. From these statistical returns we extract the following:—

Imports into Belgium.

——	1865.	1866.	1867.	1868.	1869.	1870.
	Tonnes.	Tonnes.	Tonnes.	Tonnes.	Tonnes.	Tonnes.
From Zollverein - - -	1,338	22,087	93,541	19,367	7,844	—
From Holland - - -	708	26,709	97,687	54,445	25,844	—
From France - - -	54,076	69,145	62,674	72,886	74,715	—
From United Kingdom - -	17,809	61,486	169,089	101,017	117,887	—
Total - - -	73,931	179,427	423,005	247,743	226,893	—

Exports from Belgium.

——	1865.	1866.	1867.	1868.	1869.
	Tons.	Tons.	Tons.	Tons.	Tons.
Total Quantity - - -	3,567,687	3,971,772	3,564,364	3,754,645	3,674,330
Of this to France - - -	3,350,782	3,818,712	3,442,226	3,607,721	3,523,853

Appendix Foreign (7), p. 219.

A detailed table of the total production of Belgium will be found in the Appendix, and the exports since 1815.

Those returns are not in agreement with the returns given by the *Renseignements Statistiques* of Belgium; it is presumed that they are made up to a different date; they are, however, sufficiently close to show the real progress of the coal industry. The following note from La Houile confirms the above.

"Our exportations of mineral combustibles have ceased their retrograde movement, since they exceeded by 194,314 tons of coal and 23,068 tons of coke those of 1867. According to the *Moniteur Belge*, the various destinations of the exportations of coal and coke during the last three years are thus exhibited:—

Coal.

——	1866.	1867.	1868.
	Tons.	Tons.	Tons.
France - - -	3,818,712	3,442,416	3,611,721
Netherlands - - -	137,751	108,727	127,624
Zollverein - - -	6,622	6,504	12,806
Russia - - - -	947	1,324	1,475
Switzerland - - -	794	11	—
Turkey - - - -	—	1,299	600
Other Destinations - -	6,946	4,027	4,396
Total - - -	3,971,772	3,564,308	3,758,622

Coke.

——	1866.	1867.	1868.
	Tons.	Tons.	Tons.
France - - -	511,132	390,097	332,649
Zollverein - - -	35,615	126,482	206,293
Netherlands - - -	367	319	434
Other Destinations - -	440	—	590
Total - -	547,554	516,898	539,966

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GERMANY.

The Germanic Union, the Zollverein, embraces the following principal coalbeds:—

German States { Saxony. / Bavaria. / Duchy of Hesse.

Prussian States { La Ruhr, in Westphalia. / Silesia. / Saarbrück, and provinces of the Bas Rhin.

The true coal of Prussian Silesia stretches for a distance of seventeen leagues. The most recent information we have been able to obtain as to its production would appear to give above 850,000 English tons. The coalfields of Westphalia were described by Sedgwick and Murchison in 1840. The productive coalbeds are on the right bank of the Rhine, and possess many features in common with the English coalfields. Bituminous wood and lignite or brown coal occur extensively in some districts. The coal basin of Saarbrück, a Rhenish province belonging to Prussia, has thus been described by Humboldt, chiefly from a communication received from M. Von Dechen:—

"The depth of the coal measures at Mont St. Gilles, Liège, I have estimated at 3,650 feet below the surface, and 3,250 feet below the sea level. The coal basin at Mons lies fully 1,750 feet deeper. These depressions, however, are trifling, when compared with that of the coal strata of the Saar rivers (Saarbrück). After repeated trials, I have found that the lowest coal strata known in the county of Duttweiler, near Bettingen, north-eastward from Saar-louis, dip 19,406 feet, and 20,656 under the level of the sea."

The coal of the valley of the Glane is bituminous, and of good quality; it is procurable at a depth of 112 feet, and the seam is about two feet in thickness. About 50,000 tons annually are produced from this valley. Coal is found in Wurtemburg, but not much worked. In Saxony are extensive mines of bituminous coal; at Schonfield, near Zivickau, the coal alternates with porphyry. Near Dresden a bituminous coal is also worked, and the coke manufactured from it is used in the metallurgical works at Freiburg.

Electoral Hesse produces little beyond lignite. In Hesse Cassel some bituminous coal is worked, but to a very inconsiderable extent. Real stone coal is only as yet produced in the county of Schaumburg. It is rich in beds of brown coal.

In the *Thuringerwald* or Thuringian forest some coal is produced.

The following is a list of the coal basins and their situations:—

1. Bassin de la Worm, or de Kohlscheider.
2. Bassin de l'Inde, or d'Eschweiler.

} Both situated on the lengthening of the Belgian circle, near the Bassin de Liège.

3. Bassin de Sarrebruck.
4. Bassin de la Forêt-Noire. In the Grand Duchy of Baden.
5. Bassin de la Westphalia or de la Ruhr.
6. Le Bassin d'Ibbenburen.
7. Bassin de Piesberg. Near Osnabruck.
8. Bassin d'Ilefeld. To the south of the Hartz.
9. } Les Bassins de Wettin, Lobejun, and Plotz.
10. }
11. Thuringerwald. Near Manebach.
12. Gelberg. Near Ilmenau.
13. Mordflech. Near Goldlauter.
14. De Crock.
15. Stockeim et Neuhaus.
16. Erbendorf.

} In the Upper Pfalz of Bavaria.

17. Bassin de Zwickau-Chemnitz. In Saxony.
18. Bassin de Flohaer.
19. Bassin de Plauen. Near Dresden.
20. Schonfield. Near Altenburg.
21. Brandau. In Bohemia.
22. Bassin de Radmitz. In Bohemia.
23. Bassin de Pilsen.
24. Bassin de Schlan-Rakonitz.
25. Bassin de la Basse Silésie. In Bohemia.
26. Bassin de la Haute Silésie. Partly in Prussia and partly in Austria.
27. Bassin de Mahr-Ostrau.
28. Bassin de Rossitz. In Moravia.

PRUSSIA.

The coal pits of the most importance are in the Rhenish provinces and Westphalia, in the western parts of Prussia, as well as in the province of Silesia. Among the coal basins there are three of importance; these are the basins of Upper Silesia, of the Ruhr, and the Saar. Two other basins, near Waldenburg, in Lower Silesia, and near Aix-la-Chapelle, in the Rhenish province, are less considerable. The basins of Wellin and Löbejun in the province of Saxony, and of Ibbenbüren in the northern part of Westphalia, are of less extent. There is also some coal mining, but inconsiderable, near Minden, on the Weser, in Wealdenthon, and near Löwenburg in Silesia.

The brown coal of most importance is found in the eastern part of the country; that is, in the provinces of Saxony and Brandenburg. There this lignite is exceedingly useful, as coals are excessively dear, owing to the cost of transporting them so great a distance.

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Westphalia and the Ruhr Basin.

The coal pits of the river Ruhr extend over ten miles in length on the Lower Rhine. This country supplies almost half of the coal produce, and it sends supplies to Alsatia and Switzerland, to Bavaria and Thuringia, to Berlin and the seaports of the Hanseatic Forms, as well as to Holland.

The following, from an article on "Westphalia and the Ruhr Basin," by Mr. T. E. Cliffe Leslie, contains most valuable information:—*

"Twenty years ago the Ruhr Basin was nowhere in the industrial race; now it produces nearly half as much coal as the great northern coalfield of England. Twenty years ago it had only just completed a single line of railway; now the basin is a network of branches, connecting not only the towns, but the principal manufactories and collieries with the three main lines which traverse it. The following figures show the rate at which the production of coal has advanced:—

Date.	English tons.†	Date.	English tons.†
1851	1,771,454	1860	4,276,254
1852	1,921,962	1861	4,964,621
1853	2,146,275	1862	5,701,201
1854	2,670,099	1863	6,300,981
1855	3,252,323	1864	8,146,433
1856	3,510,502	1865	9,276,685
1857	3,635,256	1866	9,329,503
1858	3,898,502	1867	10,526,015
1859	3,793,356		

"The immense increase of production shown in these figures is mainly attributable to the introduction of railways and the low charge for the carriage of coal. Down to 1851 the Ruhr and the Rhine were the only means of transport in districts beyond the immediate neighbourhood of the collieries, and the greater part of the coal was of an inferior kind, raised where it came to the surface by small collieries along the Ruhr. In 1851 the Cologne-Minden Railway came into use for the transport of coal, and led not only to deep-pit sinking, and the discovery of seams of superior coal in other parts of the basin, but also to the establishment of ironworks and other manufactures, affording a local market for the coal. To this local market, down to 1859, it was in a great measure confined. In that year the charge for railway carriage of coal for long distances was reduced to one *pfennig* per *centner* (a fifth of a farthing per 100 lbs.) per German mile,‡ and the above figures show the subsequent increase of production. The railways and coal mines render each other reciprocal service; the carriage of Westphalian coal is now one of the most important branches of traffic on several of the chief Prussian lines, and the low rates at which it is carried enable it to find a distant market. The projected reduction of the rate for the transport of iron ore to the same tariff as that for coal, when carried into effect, will greatly augment the market for coal as well as for manufacture of iron. Until the last few years the Ruhr Basin excelled only in the manufacture of steel; but its iron manufactures are now of the highest quality."

The Westphalian coalfield is stated to be at least 400 square miles in extent. The number of workable seams are from 60 to 80, and the average thickness of coal is about 200 feet. The coal is of good quality, as the analysis of Essen coal shows:—

Carbon 88·08, hydrogen 5·00, nitrogen 1·39, oxygen 3·12, sulphur 1·06, ashes 1·35 = 100.

Mr. Consul General J. A. Crowe, in his Report on the Trade of the Rhenish Provinces and Westphalia, gives the following:—

The coalfields of the Ruhr extend over a surface of 115 square miles, and are supposed to contain 40,000 million tons of fuel. They are comprised chiefly in the Government districts of Duisburg, Essen, Bochum, Dortmund, and Hamm. The rapid increase of their production may be seen by a glance at the following table:—

	British Tons.	
1855	3,252,223	
1856	3,510,501	
1857	3,635,256	
1858	3,898,502	
1859	3,793,355	
1860	4,276,253.	Increase since 1855 1,024,030 tons.
1861	4,964,621	
1862	5,701,201	
1863	6,300,318	
1864	7,474,935	
1865	8,535,614.	Increase since 1860 4,259,361 tons.
1866	8,583,362	

* Fortnightly Review, No. XXVII. March 1st, 1869.

† The Prussian *tonne* is a measure of capacity, and varies therefore in weight as applied to different articles—coal and iron, for example. The quantity of coal in a *tonne* is about one-fifth of an English ton. In some of the reports in English blue-books the *tonne* is translated "ton," which may mislead readers.

‡ The German mile is about 4¾ English.

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THE WORKING OF THE ROYAL MINES OF THE COAL BASIN OF SARREBRUCK. Sarrebruck.

Years.	Total Quantity produced.	Quantity sold.	Value of Sales in Francs.			
			Prussia.	Zollverein.	Suisse.	France.
	Tons.	Tons.				
1863	2,157,879	1,944,884	494,421	445,270	78,966	961,589
1864	2,551,129	2,307,257	576,078	574,596	116,278	1,082,256
1865	2,821,695	2,490,418	703,776	574,371	125,709	1,131,843
1866	2,951,034	2,612,328	682,185	537,361	119,030	1,321,254

M. Vuillemin gives the following as the result of the workings for four years :—

BASSIN DE SARREBRUCK.

Years.	Metrical Tons, 2,200 Lbs.	Value in Francs.	Value per Tonne in Francs.
1864	2,597,516	24,011,048	9·24
1865	2,872,999	27,638,250	9·62
1866	3,004,690	32,841,262	10·93
1867	3,171,125	33,994,460	10·72
Mean	2,911,582	29,621,255	10·17

BASSIN DE LA RUHR (District de Dormund).

Years.	Metrical Tons, 2,200 Lbs.	Value in Francs.	Value per Tonne in Francs.
1864	8,146,433	49,856,170	6·12
1865	9,165,675	62,693,217	6·84
1866	9,291,250	—	—
1867	10,366,035	—	—
Mean	9,242,348	—	—

Mr. Lowther in his Report remarks, "The western parts of Prussia are so richly furnished with "mineral fuels, particularly coals, that they do not depend for their supply on foreign countries, but "rather give up a great part of their coal produce to the latter. The eastern provinces of the state "have to look to the import of foreign coal, partly from Westphalia, partly from foreign countries.

"This is particularly the case with countries on the Baltic, which receive by sea coal cheaper from "British harbours than from distant inland mining districts. The provinces of Saxony and Branden- "burg, particularly when near the watercourses of the Elbe, receive important quantities of British "coal and Bavarian brown coal, as well as great imports of coal by railway from the pits of Zwickan "and Chemnitz in the neighbouring kingdom of Saxony; these pits are daily improving in extent and "value."

In 1860 the central bureau of the Verein at Berlin published abstracts of the produce of coals in the territory of the Zollverein, and included in those returns the imports, exports, and home consumption. Coal of the Zollverein.

Produce, Import, and Export of Coal in the territory of the Zollverein in Metrical Tons.

	1860.	1861.	1862.	1863.	1864.
	Tons.	Tons.	Tons.	Tons.	Tons.
Produce	12,347,828	14,133,048	15,576,278	17,000,000	19,500,000
Import	755,082	871,299	894,893	925,900	733,228
Total	13,102,910	15,004,347	16,471,171	17,925,900	20,233,228
Of which exported	1,810,472	2,074,906	2,107,384	2,078,890	2,233,228
Remaining for Home Consumption	11,292,438	12,929,441	14,363,787	15,847,010	18,000,000
Of the Imports there were probably of British origin	732,133	843,360	864,390	903,557	643,088

There is some uncertainty about these returns, which there is some difficulty in reconciling. An official return of the Zollverein gives as follows:—

Years.	Coal.	Lignite.
	Tons.	Tons.
1861	14,133,098	4,622,312
1862	15,576,278	5,084,399
1863	16,906,707	5,459,494

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Zollverein coal.

In the following table is shown the produce of coal and brown coal during the years 1838 to 1861 in Prussia, as well as the import and export of coal to and from states not belonging to the Zollverein across the Prussian frontier.

——	1838–41.	1842–46.	1847–51.	1851–56.	1857–61.	1862.	1863.	1864.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Total production of Coal and Brown Coal - -	2,901,713	3,817,190	5,027,690	8,571,070	13,037,015	16,903,520	18,330,779	21,197,266
Import of Coal - -	150,963	242,534	380,031	490,115	658,388	684,832	709,983	—
Total - -	3,052,676	4,059,724	5,416,721	9,061,185	13,695,403	17,588,352	19,040,762	—
Export of Coal - -	377,049	385,019	467,285	945,744	1,649,386	1,866,205	1,880,927	—
Remaining for Home Consumption - - -	2,675,627	3,674,705	4,949,436	8,115,441	12,046,017	15,722,147	17,159,835	—

The following letter from Lord Clarendon to Mr. E. Hussey Vivian, and its enclosure, bears directly upon the subject under consideration.

Sir, Foreign Office, July 7th, 1869.

I am directed by the Earl of Clarendon to transmit to you, for the information of the Coal Enquiry Commission, a copy of an article received from Her Majesty's ambassador at Berlin giving a statistical account of the coal trade between Great Britain and the North German Confederation.

This article appeared in the "North German Correspondent," and the information it contains is taken from an official source.

I am, Sir,
Your most obedient humble Servant,
Charles Spring Rice.

Hussey Vivian, Esq., M.P.,
House of Commons.

"Statistics.

"The consumption of English coals in Berlin and the Prussian inland provinces has for some years past shown a gradual diminution, owing to the increasing use of Silesian and Saxon (Zwickau) coals. Notwithstanding this, the whole importation of English coals into the Zollverein from 1857 till 1867 shows an augmentation of 4,418,300 cent. or 22 per cent., an increase entirely owing to the very large consumption of these coals in the maritime provinces of Prussia, which can procure them cheaper by sea from England than from the interior or from Saxony by land carrirge. In the ports of the North-German Confederation, English coals are yearly becoming more important as an article of commerce. In 1867 Lübeck imported 22,299 tons; Memel, 35,319; Neufahrwasser, 16,840; or, together, 74,458 tons of English coals; and there is not a single Baltic port in which their purchase and sale do not give rise to large transactions every year.

"The Staats-Anzeiger collates the quantities of coals raised in England and Prussia respectively during the years 1867 and 1868. In Great Britain, in the former year, 3,195 coal pits, with 333,116 workmen, produced 105,078,000 tons, or 2,133,083,000 Zollcentners. In 1868 the production had fallen to 104,000,000 of tons, or 2,121,000,000 Zollcent., while the number of pits had risen to 3,291 and that of the miners to 346,820. In Prussia, during the year 1867, 426 pits, with 102,773 workmen, produced 420,571,116 cent. coals, and in 1868, with 106,348 men, they yielded 454,486,660 cent. While the coal production of Great Britain, in the year 1854, was ten times greater than that of Prussia, being 64,661,000 tons, or 1,312,618,300 cent. against 136,225,096 cent., in 1867 it was only five times as great, and in 1868 only 4·6 times. Leaving out of account the recent territorial acquisitions of Prussia, we find the production of coals in the old provinces amounted, in 1868, to 4·7 of that of Great Britain. While the amount of coals raised in the latter country from 1854 to 1868 increased by 40,000,000 of tons (812,000,000 centners), or 62 per cent., it rose in the old Prussian provinces to no less than 310,379,729 centners, or 227·8 per cent. The average yield of a coal pit in Great Britain, in 1867, was 667,000 centners, and in 1868, 644,000 cent.; in Prussia it was 987,000 cent. in 1867, and 1,067,000 cent. in 1868. On the other hand, the average quantity raised by each miner in the two years was 6,398 and 6,116 cent. in Great Britain, and 4,092 and 4,273 cent. or 43 per cent less in Prussia. The proportion of accidental deaths of miners in 1867 was 1 in 280, and for every 1,792,499 cent. coals produced in Great Britain; in Prussia 1 man in 352·5, and for every 1,440,157 cent. raised. Of the entire accidents in British mines in 1867, 24·03 per cent. were caused by explosions, against 13·31 in Prussian pits; 37·73 per cent., against 36·13 in Prussia, by earth slips; 17·73 per cent. against 25·26 in Prussia, by other accidents under ground; 7·40 per cent. against 3·07 by accidents above ground; and 13·11 per cent. against 22·18 by accidents in the shafts."

Prussian coal.

A report made upon the subject of coal, quoted by Mr. Lowther in his Commercial Report to the Foreign Office gives as follows the average production of coal and brown coal in Prussia.

	Metrical Tonnen.
In four years 1838–41 - - - -	2,901,713
In five years, 1842–46 - - -	3,817,190
„ 1847–51 - - - -	5,027,690
„ 1852–56 - - -	8,571,070
„ 1857–61 - - - -	13,037,015
In 1862 - - - -	16,903,520
In 1863 - - - - -	18,330,779
In 1864 - - - -	21,197,266

This shows that the workings of the collieries of Prussia are continually increasing. The year 1864 shows an increase of two and a half times greater than the middle of 1852–56, and four times more than that of the middle of 1847–51, and more than seven times the medium produce of 1838–41.

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From 1852 to 1862 the produce was doubled, and from 1847–51 to 1864 the quantity of coal was quadrupled.

A table given in Appendix shows how the above was obtained, and its value at the pit's mouth. Appendix, Foreign. Table No. (8), p. 220.

The following statement of production of coal in Prussia in 1855 and 1865 shows that in ten years there has been the remarkable increase of upwards of 10,000,000 tons.

Name of Place.	1855.	1865.	Increase.
	Tons.	Tons.	Tons.
Westphalie - - -	3,433,718	9,002,026	5,568,308
Silésie - - -	1,797,959	4,227,830	2,429,871
Sarrebruck - - -	1,502,580	2,896,142	1,393,562
Waldenburg - -	564,191	1,186,526	682,335
Aix-la-Chapelle - -	553,634	767,250	213,616
Ibbenbaeren - -	49,696	99,098	49,696
Wettin et Lobejun - -	43,116	71,401	28,285
Minden - - -	18,169	9,821	—
Total - - -	7,963,063	18,260,094	10,297,031

In a work on the coal trade of this country we find a return of the production of coal in Prussia in 1837 as 2,078,696 tons; in 1838 at 2,308,368 tons; and in 1839 at 2,442,632 tons. We imagine this includes brown coal.*

The Produce of the Prussian Coal Fields from 1837 to 1863 is from the official return.

Years.	Coal.				Brown Coal.	Total of Coal and Brown Coal.
	Silesian.	Rhenish Provinces.	Westphalia and Saxony.	Total of Coal.		
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1837	—	—	—	1,559,021	391,894	1,950,915
1857	2,361,164	1,917,508	2,825,885	7,104,557	2,736,663	9,841,220
1858	2,725,600	2,048,460	3,038,911	7,812,971	2,908,352	10,721,323
1859	2,489,083	1,849,696	1,959,388	7,290,627	3,052,446	10,343,073
1860	2,613,375	2,068,843	3,310,325	7,992,543	3,153,294	11,145,837
1861	3,758,473	2,235,903	3,840,062	8,834,438	3,320,572	12,155,010
1862	3,184,539	2,230,573	4,394,058	9,809,170	3,681,896	13,491,060
1863	3,581,866	2,333,182	4,833,637	10,748,685	4,003,044	14,751,729

	s.	d.	
Average price of coal at the pit - -	5	7¾	per ton.
" " - -	2	9¼	"

Prussia.		Centner.	Statute.
		100 Metrical Pounds.	Tons.
Coal -	1867 - -	420,571,116	21,310,188
	1868 - -	454,630,648	23,035,972
	1869 - -	475,221,881	24,123,970
Brown Coal	1867 - -	110,277,562	5,587,719
	1868 - -	112,046,463	5,677,398
	1869 - -	120,293,754	6,005,062

The following statement from the *Engineer* so fully sets forth the present position of Germany in respect of its coal that we deem it worthy of preservation in those pages:—

Coal seems destined to play a prominent part in future years in Germany. This is shown by the great and continuous increase in the production year by year during the memorable sixth decade of the present century. Commencing with 1860 and ending with 1869, both inclusive, the yearly production of coal in Germany was as follows:—1860, 12,347,828 tons; 1861, 14,133,048 tons; 1862, 15,576,278 tons; 1863, 16,906,707 tons; 1864, 19,408,982 tons; 1865, 21,794,705 tons; 1866, 21,629,746 tons; 1867, 23,738,327 tons; 1868, 25,704,758 tons; 1869, 26,774,368 tons. In other words, Germany would seem to have raised in 1869 double as much coal as France, and about one fourth as much coal as Great Britain. The Germans are still very far behind us in the matter of coal mining, but they would appear to have now broken ground in earnest. If we compare the production of 1869 with that of 1860 we see an increase of 14,426,540 tons, or 117 per cent. Coal seems to have been rather cheaper in Germany in 1869 than in 1860, since while the increase in the production was 117 per cent. the increase in the value was only 97 per cent. In the production of 1869 Prussia was represented by 23,761,094 tons, or 88·70 per cent.; Saxony by 2,584,292 tons, or 9·60 per cent.; Bavaria by 340,571 tons, or 1·30 per cent.; and the other states of the Zollverein by 88,411 tons, or 0·40 per cent. In coal, as in war, Prussia thus stands foremost among the nations forming the Zollverein; and in coal legislation, as in war making, Prussia can probably do pretty much as she likes. It would appear that

* Dunn on the Coal Trade.

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the quantity of coal exported in 1869 from the Zollverein was 3,984,828 tons, or 14·90 per cent. of the whole extraction. In the total of 3,984,828 tons France figured for 1,720,514 tons, or 43·20 per cent.; and the Low Countries were represented by 1,259,159 tons, or 31·60 per cent. The quantity of coal imported into the Zollverein in 1869 was 1,856,149 tons, of which 401,492 tons, or 21·60 per cent., came from Belgium, while 25,880 tons, or 1·40 per cent., were obtained from France. Adding to the indigenous coal production of the Zollverein in 1869 the amount of the coal imported, and deducting from the total the quantity exported, we find that the consumption of coal in the Zollverein in 1869 was 24,645,689 tons. Of this consumption the Zollverein itself supplied 92½ per cent., while foreign imports made good the remaining 7½ per cent. On making a corresponding calculation for 1860 we find that in that year the coal consumption of the Zollverein was 11,292,437 tons; the consumption of 1869 accordingly presented an increase of 13,352,252 tons, or about 118 per cent. In 1860 the coal consumption of the Zollverein was 6¾ cwt. per head of the population; in 1869 it had grown to 12⅞ cwt. per head of the population. An increase of 6⅛ cwt. per head would thus seem to have been established in the ten years; in other words, the coal consumption of the Zollverein increased during the decade to the extent of 91½ per cent., while the population only increased in the same period to the extent of 14¼ per cent.

DUCHY OF NASSAU.

Coal of Nassau.

The total yield of coal amounted in the year 1864 to 1,032,000 centners (the centner equals 50 kilogrammes.)

Of this amount, the home consumption represented 659,000 centners, and the quantity exported 373,000 centners.

The following are the different varieties of coal in the Duchy:—

Biquit, a bituminous wood preserving in a complete form the component parts of wood, of light or dark brown colour, in contiguous layers, or more frequently irregularly mingled with the other varieties of coal.

Pseudolignit, a species of coal wherein the component parts of wood are more obliterated and concealed. The "Pseudolignits" have the appearance of masses of earth in the coal shaft, which masses, when recently detached, present a dull edge of earth, but which, when brought in contact with the atmosphere, take a compact form, and assumes a shelly edge, having the lustre of wax.

On further removing the component parts of wood, the true "earth coal" shows itself; but partly owing to the presence of clayey substances, to considerable quantities of pulvurent limeclay, and to the difficulty which attends its ignition, it is unserviceable, and consequently cannot be utilized in working the mine.

Meerkohl (*lit.* sea coal). A miry earth coal, more resembling turf, but containing little pulvurent limeclay. The Reichelsheimer coal may principally be classified under this category. That coal, however, contains a large quantity of "Biquit."

Blätter Niohl (*lit.* leaf coal). A dark coloured aggregate of decomposed leaves.

SAXONY.

Coal produced.	Coal.	Brown Coal.
	Tons.	Tons.
1859	1,355,619	300,439
1860	1,463,398	320,632
1861	1,689,018	369,182
1862	1,730,216	399,740
1863	1,902,175	428,615

The Grand Duchies of Hesse and Nassau produced, in 1864, of lignite—

Nassau - - - - - - -	46,071 tons.
Hesse - - - - - -	33,225 „
Total - -	79,296

Coal of Electoral Hesse.

Electoral Hesse in 1865.

Province or District.	Coal.	Lignite.
	Tons.	Tons.
County of Schaumburg - -	308,150	—
Province of Lower Hesse -	—	125,500
„ Upper Hesse - -	—	43,750
„ Fulda - -	—	1,350
Total - -	308,150	170,600

A pictorial map, showing the production, consumption, and circulation of coal, enables us to trace the lines of distribution of British coal.

The largest proportion of British coal reaches Prussia by Hamburg, from whence about half passes to Berlin; of the remainder, Magdeburg receives a considerable proportion; and a thin stream passes on to Weimar and Erfurt; another branch passing to Wittenberg and on to Riesa. From the coast some small quantities reach Bremen, Varel, Emden, and Leer. Copenhagen receives coal, of which one small division passes to Stralsund; a larger portion goes to Stettin, and on to Berlin. Memel, Tilsit, Konigsberg, and Gumbimen receive British coal in small quantities. A portion passes from Danzig to Marienwerder. Bromberg, Landsberg, and Posen receive some; and a very small quantity passes to Konin.

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GRAND DUCHY OF BADEN.

Coal of Grand Duchy of Baden.

There are at present only three coal mines in the Grand Duchy of Baden; one at Berghaupten in the district (Bezirksamt) of Gengenbach, another at Zunsweier, in the district of Offenburg, and a third at Diersburg in the same district.

The quantity of coal (anthracite) extracted from these mines was as follows:—

From	1860.	1861.	1862.	1863.	1864.
	Tons.	Tons.	Tons.	Tons.	Tons.
Berghaupten -	3,166	1,677	1,816	1,854	3,040
Hunsweier and Diersburg	7,604	6,843	7,685	7,947	9,463
Total - -	10,770	8,520	9,501	9,801	12,503

The official returns of the produce of the Grand Duchy gave the following:—

	Tons.
1860 - - - - - -	10,619
1861 - - - - - -	8,407
1862 - - - - - -	9,375
1863 - - - - - -	9,672
1864 - - - - - -	12,338

BAVARIA.

Coal of Bavaria.

Coal and brown coal are produced in Bavaria, from Amberg, Bodenmais, Bodenwöhr, Königshütte, Kissingen, Munich, Southofen, Steben, Wunsiedel, Fichtel-Geberg, Rhein Palatinate.

Situation of the Mines.	Year.	Coal—Steinkohlen.		Brown Coal—Braunkohlen.	
		No. of Works.	Produce in Tons.	No. of Works.	Produce in Tons.
Amberg - -	1861	—	—	36	40,836
	1862	—	—	33	42,282
Bodenmais - -	1861	—	—	1	100
Bodenwöhr - - and Königshütte - -	1862	—	—	1	100
	—	—	—	—	—
Kissingen - -	1861	—	—	11	1,129
	1862	—	—	8	1,671
Munich - - -	1861	52	29,426	1*	—
	1862	59	38,686	1*	—
Southofen - -	1861	—	—	1	272
	1862	—	—	1	272
Steben - - -	1861	8	34,843	—	—
	1862	8	36,952	—	—
Wunsiedel and Fichtelberg	1861	1	740	3	3,080
	1862	1	944	2	1,540
Rhein Palatinate - -	1861	64	160,392	3	1,283
	1862	63	150,561	3	924
Total - -	1861	125	225,401	56	46,700
	1862	131	227,143	49	46,789

* Not at work.

Another return gives slightly different quantities, bearing however the same relations to each other.

Coal produced.	Coal.	Lignite.
	Tons.	Tons.
1861	219,522	45,488
1862	221,220	45,570

HANOVER.

The most considerable quantity of Hanoverian coal is found some miles south of the capital, in the mountains called Deister and Osterwald, also at Suntel, in the neighbourhood of Osnabrück.

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Hanoverian coal.

The production of coal and lignite from the mines belonging to the Government, and from private mines, has been officially given as follows:—

District.	1861.	1862.	1863.
	Tons.	Tons.	Tons.
Principality of Osnabruck:			
Government Mines - -	68,715	67,518	57,016
Private Mines - - -	18,834	22,335	27,350
On the Deister (Mountain):			
Government Mines - -	44,106	44,278	49,386
Private Mines - - -	107,317	85,838	79,455
On the Osterwald and Suntel (Mountain):			
Government Mines - -	35,184	37,168	39,271
Private Mines - - -	20,973	20,492	21,832
In the County of Hohnstein:			
Government Mines - -	6,880	7,077	8,969
Total of Coal - -	302,009	287,706	283,279

LIGNITE OR BROWN COAL.

District.	1861.	1862,	1863.
	Tons.	Tons.	Tons.
Near Munden and Wallenden:			
Government Mines - -	2,350	3,074	1,816
Near Dransfield:			
Private Mines - - -	2,078	1,761	2,320
Total of Brown Coal -	4,428	4,835	4,136

SUMMARY.

——	1861.	1862.	1863.
	Tons.	Tons.	Tons.
Coal - - - - -	302,009	287,706	283,279
Brown Coal or Lignite - - -	4,428	4,835	4,136
Total - -	306,437	292,541	287,415

KONIGSBERG (PRUSSIA).

Konigsberg coal.

"About 700,000 Prussian tubs were imported, and prices fluctuated according to the political or warlike occurrences. Great expectations were raised during the war that Prussia would be able to use her own Westphalian or other coal, to the future exclusion of British, but, on cooler reflection, it is found that railway transport makes them too dear, and that, in point of quality, they cannot compete with English and Scotch coals."

AUSTRIA.

Austrian coal.

Coal occurs in Styria, Carinthia, Dalmatia, the Tyrol, Moravia, Lombardy. The basin of Vienna, in Lower Austria, produces several varieties of coal, which belong to the brown coal of the tertiary period.

GEOGRAPHICAL POSITION OF COAL NOW WORKED.

Province.	District.	Principal Mines.	Coal.	Brown Coal.
			Tons.	Tons.
Bohemia - -	Prague - -	Bustiehrad - -	777,130	—
		Brandeisl - -		
		Kladno - - -		
	Elbogen - -	- - -	- - -	124,436
	Kommotau - -	- - -	1,509	643,190
	Pilsen - -	- - -	282,289	22
	Kuttenberg - -	- - -	155,919	33,124

* Report of Mr. Consul Hertslet on the trade of Konigsberg for the year 1864.

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Austrian coa

Province.	District.	Principal Mines.	Coal.	Brown Coal.
			Tons.	Tons.
Moravia and Silesia	Olmütz, Ostrau	-	670,517	64,763
Upper and Lower Austria.	St. Pölten	-	37,077	187,673
Styria	Leoben, Cilli, Köflach	-	2,833	372,332
Carniola	Laibach	Sagor Lokach, Seheming, Valley of Save	-	54,925
Carinthia	Klagenfurt	Bleiberg, Ober Laibach	-	39,602
Tyrol	Hall, Kufstein, Mori	-	-	5,978
Crotia, Military Frontier and Slavonia.	Agram	Gross Franoviona, Rohitsch, Drenkowa, Posega	-	8,193
Hungary and Transylvania.	Ofen, Fünfkirchen, Grau, Oravicza, Kronstadt	-	290,858	228,388
Galicia	Cracow, Brody, Lemberg	Jarvorzno	96,795	10,423
Venetia	Arzignano, Val d'Agno	-	300	5,878
Istria and Dalmatia	Zara, Sieverich, Cattaro	-	-	7,540
Bukovine	-	-	-	200

Coal map of Austria.

COAL MAP of the AUSTRIAN EMPIRE.—M. Goetterle, of the Imperial Institute of Geology, has prepared, with the assistance of M. Hofer, mining engineer, a very complete map of the coalfields of the Austrian empire. The geological position of the deposits of combustible minerals are indicated there by four distinct colours (trias, lias, chalky soil, tertiary deposits), and the annual production, amounting to the number of 50,000 quintals, or, on the other side, by squares of different colours, corresponding to a scale at the side, indicating the quantity of produce from mines traced along the railroads and the course of navigable rivers, and therefore from each of these squares, of which they bear the colour. A single glance on this map suffices to show that the great majority of the deposits in question are found in the north-west portion of the empire, and that the tertiary deposits do not yield in importance to the more ancient formations. The principal facts verified on this map can be summed up thus:—

Deposit or Basin.		Annual Production.	Export or Consumption.
		Quintals.	
Carboniferous Formation.	Kladusand Ostrau (Bohemia)	32 millions	By the railroad from the north, and starting from Vienna, by the Danube as far as Gray, Pesth, and Passau. Consumption between Ostrau and Vienna, 7 millions; at Vienna, 5 millions. The coal of Kladno supplies Prague, Reichenberg, and part of Brunn, and is exported to Saxougand as far as Magdebourg.
	Pilsen (Bohemia)	10 millions	Vienna, Tyrol, North of Italy, as far as Verona, Bavaria, Wurtemburg.
	Rossizand Oslowau (Moravia)	4 millions	Moravia, and Austria as far as Vienna.
	Schaglar (Silesia), Zaworzno (Gallicia)	3 millions	Local consumption.
Lias.	Fünfkirchen (Hungary)	4 millions	South Danubian region as far as Galatz.
	Steiendorfe Douan (Banat)	3 millions	Ditto, and Wallachia.
Chalk Formation.	Newstadt to the south of Vienna	1 million	Vienna and S.E. of Lower Austria.

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Austrian coal. Appendix, Foreign (9), p. 221.

Deposit or Basin.		Annual Production.	Export or Consumption.
		Quintals.	
Tertiary Formation.	Tœplitz-Aussig (Bohemia) -	14 millions	Saxony and Prussia (almost entirely).
	Kamstan Do. -	4 millions.	——
	Falkenau Do. -	3½ millions.	——
	Wolfseggand Fraunthal (Higher Austria).	3 millions	As far east as Vienna ; as far west as Munich.
	Central and South Styria, and Carniole (Köflach, Leoben, Hrastnigg, &c.)	13 millions	Exported by rail to the south. Consumption on this road, 6 millions.

The total of the production of combustible mineral in the empire of Austria is about 80 million quintals a year; it is then nearly equal to that of Prussian High-Silesia. The exportation is more than 20 millions; the importation (arising from Prussia, Saxony, and England) is 6 million quintals a year. (*Imperial Institute of Geology*, sitting of the 3rd March 1868.)

The produce of Austrian coal is given in a state return as follows, the desire being to show the relation of the production of coal to the facilities afforded by the railways since 1826 :—

Years.	German Miles of Railway opened.	Amount of Coal produced.	Value in Pounds Sterling.
		Tons.	£
1826	0	148,181	52,700
1836	37	244,325	62,900
1846	180	659,440	185,370
1856	416	2,400,825	758,240
1857	490	2,580,645	762,130
1858	588	2,988,651	885,120
1859	620	3,215,774	872,560
1860	693	3,597,750	959,040
1861	735	4,174,125	1,129,490
1862	755	4,678,891	1,338,970
1863	794	4,696,393	1,382,130

The following return gives the produce of coal and lignite in the Austrian empire in the year 1862, showing the provinces which produce the same:—

Provinces of the Empire producing Coal.	Coal.	Brown Coal or Lignite.
	Tons.	Tons.
Bohemia - - - -	1,166,848	800,774
Moravia and Silesia - - -	670,517	64,763
Upper and Lower Austria - -	37,077	187,673
Styria - - - -	2,833	372,332
Carniola - - - -	—	54,925
Carinthia - - - -	—	39,602
Tyrol - - - - -	—	5,978
Croatia, Military Frontier, &c. -	—	8,193
Hungary and Transylvania - -	290,858	228,398
Gallicia - - - -	96,795	10,423
Venetia - - - -	300	5,878
Istria and Dalmatia - - -	—	7,540
Bukovine - - - -	—	200
Total - -	2,265,228	1,786,679

	Tons.
Coal - - -	2,265,228
Lignite - - -	1,786,679
Total - -	4,051,907

Appendix, Foreign. Table , No. (9), p. 221.

In the Appendix is given a table showing the produce of coal and lignite in Austria from 1823, distinguishing the production of both in all the Austrian provinces producing coal.

Anthracite has been found in the Prince Schwarzenberg mines, Turrach, near Muran, in Styria. It is, however, much lighter in weight, much softer, and more brittle than the American.

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The production of coal in Austria from 1855 to 1862, in Vienna centners of 123½ pounds avoirdupois. Austrian coal.

Years.	Government Works.	Private Works.	Total.
	Tons.	Tons.	Tons.
1855	1,087,844	19,991,619	21,079,463
1856	721,927	22,271,299	22,993,223
1857	667,005	24,290,705	24,957,710
1858	834,923	27,917,772	28,752,695
1859	818,101	31,405,976	32,224,077
1860	966,713	33,822,390	34,789,103
1861	1,048,484	39,457,977	40,506,461
1862	1,074,056	43,984,979	45,059,035

The production of brown coal in Austria from 1855 to 1862, in Vienna centners.

Years.	Government Works.	Private Works.	Total.
	Tons.	Tons.	Tons.
1855	911,593	15,527,713	16,439,306
1856	1,070,255	17,690,014	18,760,269
1857	1,074,135	18,848,911	19,923,046
1858	1,033,698	22,189,381	23,223,079
1859	764,640	22,937,788	23,702,428
1860	1,098,653	26,681,823	27,780,476
1861	1,293,116	30,793,665	32,086,781
1862	1,657,982	34,577,365	36,235,347

The following return distinguishes the coal of Austria into two varieties of stone coal and brown coal:—

Year.	Steinkohle. (True Coal of the Trias and Liassac Periods.)	Braunkohle. (Lignite of the Eocene and Miocene Periods.)	Total.
	Tons.	Tons.	Tons.
1855	1,162,238	906,363	2,069,601
1860	1,473,343	1,527,173	3,000,516
1861	2,233,324	1,769,025	4,002,349
1862	2,483,830	1,993,422	4,487,252
1863	2,512,279	1,990,861	4,503,140
1864	2,498,162	2,090,852	4,589,014

Exportation of Coal from AUSTRIA.

	Tons.
1867	344,911
1868	569,291
1869	853,303
1870	1,007,730

Exportation from Austria.

NETHERLANDS.

There is only one coal mine in Holland. It is situated in the province of Limburg; the production being about 25,000 tons per annum of coal of a very inferior description. Netherlands coal.

The following table shows the quantity of coal produced from the coalfield of Kerkrade, which belongs to the Crown:—

	Half Mudden.*		Tons.	cwts.
1861	548,820	=	27,442	0
1862	479,210	=	23,960	10
1863	482,590	=	24,129	10
1864	496,300	=	24,815	0

The small quantity of coal used in working the mine has been added (by estimate) to the tons.

HANSE TOWNS.

"The total import of coals and cinders in 1863 amounted to 271,998 centners, or 14,562 tons, which came almost exclusively from Newcastle, Sunderland, and other British ports, as the quantity brought Hanse Towns.

* The mud of coal is two and three quarter imperial bushels; about 10·8 mudden to the ton.

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Hanse Towns coal.

into Hamburg from Altona was likewise originally imported from Great Britain. Total value of coals and cinders 5,527,450 marks banco. Average price of coals 25 marks 8 schillings current, of cinders 22 marks 13 schillings current, per last of two tons."*

The following were the imports of coal into Hamburg for the years given, showing how small was the variation in the coal imports during the interval of ten years:—

——	1856.	1857.	1858.	1859.	1864.	1866.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
From Great Britain -	189,263	202,143	225,696	225,156	236,239	263,844
Via Altona - -	54,012	33,351	24,283	17,447	37,253	8,630
Other countries -	886	1,180	894	940	Not returned.	Not returned.
Tota - -	244,161	236,674	250,873	243,543	276,901	272,838

POLAND.

Poland.

There are a few unimportant coal mines in Poland. The Crown coal mines produce about 1,000,000 sacks of three and a half bushels each. The coal mines of the western district produce about 8,000,000 lbs. per annum. It is, however, very doubtful if 3,000 tons are really obtained from those mines.

DENMARK.

Denmark.

The island of Bornholm and some other islands belonging to Denmark produce coal, but it would appear to belong to the Bovey coal variety.

Two coal mines in the island of Bornholm are the only ones existing within the kingdom of Denmark; one is situated near Ronne, and the other near Hasle, but are merely sufficient to supply the island with coal.

	Tons.
1862 - - - - -	3,278
1863 - - - - -	3,254
1864 - - - - -	2,755

Of all the coal used in Denmark, according to Mr. G. Petre, during the last five years, 99·8 per cent. came direct from Great Britain.

SWEDEN.

Sweden.

Anthracite is found in small quantities at Dannemora; and bituminous coal is worked at Helsingborg, at the entrance of the Baltic.

A mine has been worked for some years at Hoganas in Scania, and about 30,000 tons of coal are produced annually.

Recently coal has been discovered about six English miles east of Landskrona.

According to the official returns published by the Stockholm Board of Trade, there is a small but exceedingly unimportant export of coal.

——	The Importation of Coal.	The Exportation of Coal.
	Cubic Feet.*	Cubic Feet.
1854	4,792,923	11,004
1856	8,189,821	51,828
1858	8,766,182	13,086
1860	11,791,612	4,044
1863	15,584,339	378

* 53 cubic feet (Swedish) to one ton.

RUSSIA.

Russian coal.

"The Geology of Russia in Europe and the Ural Mountains† thus describes the several known coal districts:—

Bituminous Schists with Coal.—On the Msta the coal is so thin and so poor as hardly to merit that name. On the Priutchka, however, the bituminous schists, having a total thickness of about 40 feet, are characterised in their upper portion by four beds of impure, imperfectly consolidated, pyritous coal, which is partially extracted in horizontal galleries. The uppermost bed is ten inches, and the lowest five thick.

Lichvin.—In the zone of country extending from the north of Lichvin on the west by Peremishel to Tula, the lowermost carboniferous strata which succeed to the Devonian rocks consist of sand and shale and thin coal seams * * * At Jeleniena, north of Lichvin, bands of poor coal appear

* Mr. Consul General Ward on the trade of Hamburg for 1863, and Vice-Consul Schwoon on the trade at Bremerhaven, &c., in 1866. The Mark Banco of the Hanse Towns is equal to 1*s.* 6*d.*

† The Geology of Russia in Europe and the Ural Mountains, by Roderick Impey Murchison, Edouard de Verneuil, and Count Alexander von Keyserling.

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in a ravine under the village, subordinate to bituminous schists, some of which, like similar beds in England, sound like wood under the hammer * * * *. Near Alexina the coally matter in the same strata expands so as to form layers subordinate to sands and shale. The thickness and relations of the coal seams vary exceedingly in at least forty localities, where they have been recently explored by Colonel Olivieri. * * * Throughout this region, as in the Valdai Hills, the coal is very pyritous, impure, fragile, and light. Russian coal.

Donetz.—This region is divided into anthracite and bituminous coal. The anthracite rocks without limestone are to the north of Novo Tcherkask, and the schists, with some thin courses of limestone on the Donetz, are the equivalents of the shale, sandstone, and bituminous coal with limestone.

Krasnoi-Kut.—Of the coal of intermediate quality the beds which outcrop, and are worked in horizontal galleries, on the south slopes of the hills near Krasnoi-Kut, are cited. These coals occur in beds three feet and three and a half feet thick. They are readily extracted in the mines of General Papkoff, and have been employed in working a steam-engine used in the manufactories which he has established. They are excellent seams for their dimensions, many parts of the coal being undistinguishable from iridescant British varieties. Coal of similar quality has been observed outcropping in several places in the same neighbourhood.

Anthracite of Popofskoe.—The most important works of anthracite in this region are those on the River Grujefka, near the hamlet of Popofskoe, thirty versts north of Novo Tcherkask, to which place, and to the neighbouring rivers Don and Donetz, the coal is conveyed in the light carts of the country.

Coalfields in the Northern Tracts.—On the right bank of the larger of two small rivers called the Toretz coal is extracted by the natives for their own use in several localities.

Coal Mines of Jeleznoe or Nikitofa.—On the east bank of the Toretz lies the village of Jeleznoe. At a height of perhaps 300 or 400 feet above the stream Jeleznaia are the chief coal works. The lowest beds are about two feet three inches thick, the second and third seams about three feet thick each; these are separated by clunch, clay, and shale, and a little sandstone. The fourth seam is about two feet four inches thick. These coal seams are only worked, and worked upon a very imperfect system, by the natives, for their own immediate consumption.

Imperial Coal Works of Uspensk.—At Uspensk, which is situated to the east of the foundries of Lugan, eleven seams of coal are known, but of these only three are now worked, viz., from fourteen inches to three feet thick each, the remainder being thin, impure, and profitless.

"The coal of Uspensk being extracted on the sides of the hills high above the line of drainage of the country, no steam engines have been yet employed; but, when we were there, the difficulties having increased with the greater depth, a small 12-horse power machine had been prepared to obviate them. This coal is somewhat of that mixed nature to which we have before alluded, being very far from a pure bituminous coal, and although it gives little or no flame or smoke, compared with that of Lissitchia Balka (the great mine of the region), it is very useful in forging iron, and contains so much bitumen as to set well, and coagulate when heated."

Imperial Coal Works of Lissitchia Balka.—Including small and profitless layers, not less than 13 seams of coal are passed through in the shafts of Lissitchia Balka, seven of which are extracted for use. The greater part of the coal is of fair quality, and some exceedingly good. The larger portion may be called bituminous coal. It is a coking coal; gives much flame and smoke, and serves for reverberating furnaces.

From the report of Mr. Locock most of the particulars which follow have been derived.

Oural District.—Coal has been found in numerous places, both on the west and east side of the Oural Chain. On the banks of the River Oural the coal has been worked to supply factories. It is calculated that 20,000 tons have been already produced. The difficulties of transport interfere with the development of this coalfield.

Moscow District.—The coal district of which Moscow is the centre covers an area of 400 miles long by 300 miles broad. The coalfields of Novgorod, Moscow, Tver, Kalouga, Toula, and Rezan would be of great value were the coal of good quality; unfortunately this is not the case. Lying several hundred feet deep, in a stratum of bluish clay and sand, the coal is generally of an inferior quality. Experiments have shown that this coal is composed as follows:—Gas 43·29 to 50·30; carbon 31·19 to 41·91; ashes 10·51 to 11·47. The heating power varies from 3·998 to 4·513. It may be employed for the production of steam and in salt and gas works, but it is useless for smelting. Its price at the pit's mouth is from 4*s.* 8*d.* to 5*s.* 6*d.* per ton.

The Malewsky Coal requires drying for use, and it sometimes loses one third in weight during the process. About 12,000 tons are used annually in the Brobinsky sugar refinery.

In the governments of Toula and Kalouga a species of coal named *Russian Boghead* has been found in 23 places. It is of a brownish colour, without lustre or compactness. These are ordinary lignites. In the environs of Snamensky a somewhat similar coal is found, and it produces about 10,000 tons annually.

Don District.—The principal mineral wealth of the Don region consists in its beds of anthracite, which lie in numerous thin strata, varying from two to seven feet in thickness. The following table shows the progress made in working this coal.

	Tons.
In 1820 there were produced	350
In 1840 " "	800,000
In 1847 " "	2,860,000
In 1863 " "	6,350,000*

Besides those coal regions, coal has been discovered in the Caucasus, the Crimea, Simbirsk, Ekatarinofsky, and the steppes of the Kherson, in the government of Kieff in Poland.

* The St. Petersburg Journal "Golos" says the mines of one district alone are capable of supplying 400,000 tons for from 150 to 200 years. Since 1864 there have been surveyed in the valley of the Don 44 beds, the aggregate quantity of which is estimated at 1,284,947,375,000 pouds, or more than 18,000,000,000 tons.—*Scientific Review quoted by "Colliery Guardian," October 24th*, 1868.

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Russia.

As regards the coal found in the southern parts of Russia, it appears, from an analysis made by M. Voskressensky, of the Imperial University, that the best Russian coal is found in the neighbourhood of the Stanitza Gronscheoskaia, in the country of the Cossacks of the Don, containing 94·234 per cent. of carbon, and the most inferior is found at Tofflis, 63·649 per cent. of carbon.

General Helmersen states that in 1865 there was a large increase in the production of the coal beds of the Donetz states. Instead of the yearly average, which was about 3,000,000 or 4,000,000 pouds, equal to 64,285 tons, the quantity produced in 1865 was equal to 8,000,000 or 9,000,000 pouds, or 93,857 tons.

In 1866 the amount of the coal produced in the Donetz is stated to have been 128,571 tons.

General Helmersen states, that of the 8,000,000 pouds produced as above stated, 5,000,000 pouds were furnished alone from the anthracite mines of the Groucheoka. At present the pits of Gronscheokia provide with anthracite coal the Russian steamers navigating the Don, the Black Sea, and the Sea of Azof, and the railway which unites the Don with the Volga. This coal is also sent to Astrakan, where it is used by the steamers on the Caspian Sea, a supply being kept on the Persian island of Achonade. Its price on the Caspian is 45 copecks a poud.

There are coal mines at Lissitchansk, which belong to the Crown, but they have been but little worked. Near Stcherbmouka, Jaitsovo, and Nilsitova there are several coal beds, stated to contain many hundred millions of pouds.

Major-General N. Twanoff describes the composition of coals formed on the shores of the River Tshoosovoy and its tributary streams.

The coal from this district is found by analysis to contain—

Carbon	75·97
Hydrogen	5·42
Oxygen and Azote	13·2
Ashes	4·12

It gives coke 62·5, volatile matters 37·5, and 6·780 units of heat.

General Helmersen concludes his statement by hoping that the time will soon arrive when Russia will no longer be dependent on foreign countries for coal and iron, but that she will make her own machinery and use her own coal for her own requirements.

Quality of Coal found in the Province of Amouo.

Amoua coal.

The Report of the Imperial Academy of Science of St. Petersburgh publish the analysis of a specimen of coal from the province of the Amouo, made by the chemists M.M. Frizsche and Tinnie. The specific gravity of this coal is 1·299, which gives 55·69 per cent. of coke, and after complete combustion 11·07 of ash. The gas produced gives a brilliant flame. The coal contains a small quantity of pyrites. The elementary analysis shows:—

Carbon	59·48
Hydrogen	5·20
Water	2·19
Ash	11·07
Oxygen	22·06 and other bodies.
	100·00

The intensity of heat determined by the reduction of lead has been fixed at 58·87, corresponding to an average quality of coal.—*From the Journal of St. Petersburgh.*

The Department of Commerce has enabled Mr. Locock to give the following table, showing the value, in silver roubles of 3*s.* 2*d.*, of the coal imported into Russia since the termination of the war, and the proportion drawn from different countries:—

—	England.	Prussia.	Turkey.*	Austria.	Miscellaneous.	Total.
	Silver Rouble = 3*s.* 2*d.*	Silver Rouble = 3*s.* 2*d.*	Silver Rouble = 3*s.* 2*d.*	Silver Rouble = 3*s.* 2*d.*	Silver Rouble = 3*s.* 2*d.*	Silver Rouble = 3*s.* 2*d.*
1857	1,396,481	95,688	42,731	4,375	81,095	1,620,370
1858	1,731,094	116,955	400	8,832	34,711	1,891,992
1859	1,847,133	76,787	55,651	12,142	15,386	2,005,597
1860	2,664,682	114,506	119,035	52,128	3,323	2,955,174
1861	2,110,128	125,885	96,699	24,087	4,520	2,361,319
1862	2,375,494	248,118	14,174	24,612	3,949	2,666,347
1863	2,744,283	220,299	2,240	14,417	7,272	2,988,511
1864	4,528,545†	168,121	115,947	10,726	4,767	4,828,106

The following table shows the quantity and value of the coal imported in 1865; it is extracted by Mr. Victor A. W. Drummond from a pamphlet "*Des Gisements de Charbon de Terre en Russia,*" by G. De Helmersen, Lieutenant-General, &c.

* The coal from Turkey will have been derived from the coal mines on the Black Sea.

† It is suspected that there must be some error in the imports of British coal for this year, as the Statistical Department of the Board of Trade for 1865 gives the total value of coal imported into Russia as 1,726,866 roubles, and the British coal imported as 1,318,884. Probably we should read 1,528,545 instead of the above.

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Russian imports.

Countries.	Quantity in Pouds.	Value as Roubles.
Austria - -	75,660	3,783
Belgium - -	19,340	967
England -	26,377,680	1,318,884
Holland - -	7,260	363
Italy - -	26,400	1,320
Prussia - -	7,990,240	399,512
Turkey - -	20,240	1,012
France - -	10,500	525
Total - -	34,527,320 equal to 554,858¾ English tons.	1,726,366 equal to 222,988*l.* 18*s.* 10*d.*

The following note on Russian material progress will materially aid in guiding to a satisfactory conclusion as to the extension of the coal industries of this country and Russia.

The Russian authorities are doing their utmost to develop mechanical and metallurgical industry in Russia, but thus far not much progress has been made in this regard, and Russia has taken a very great quantity of railway iron from us this year, as will be seen by the annexed statistics, showing the shipments month by month to July 31st of the last three years :—

Month.	1867.	1868.	1869.
	Tons.	Tons.	Tons.
January -	—	—	—
February -	9	—	1,283
March - -	—	200	7,145
April - -	5,163	2,019	21,166
May - -	12,691	10,011	23,120
June - -	10,801	7,984	34,072
July - -	19,768	7,886	35,731
Total -	48,432	28,100	122,517

The shipments are still rolling on unchecked, and it is not too much to estimate the increase in the consumption of English iron in Russia this year, as compared with 1868, at 120,000 tons. As everyone at all familiar with the course of the iron trade knows, it is the Russian demand for our railway iron, coupled with a similar demand from the United States, which has given such a decided stimulus to British metallurgy this year, although we are now approaching the season when the close of the Russian navigations will involve also a partial check to the prevailing activity.

It is satisfactory to notice that British rails have been used to a much greater extent of late than Belgian in Russia, and that by far the largest proportion of the foreign railway iron imported into Russia has come from the United Kingdom.

There seems scarcely any limit to the public works on hand or in contemplation just now in Russia. Thus a report has appeared from a commission appointed to study the question of the construction of a line of railway intended to unite the Volga to the Neva, as well as to the northern Dwina, so as to assure public subsistenee in the extreme north of Russia. The commission appears to have examined the following questions :—first, the best direction to be given to a railway intended to unite the basin of the Volga to that of the northern Dwina; secondly, the possibility of uniting Lake Onega to the White Sea by a canal; and, thirdly, the best direction to be given to a railway intended to unite the Rybinsk districts and the Volga to St. Petersburgh. The Minister of Ways of Communication proposes to apply a sum of 1,000,000 roubles to the augmentation of the rolling stock on the Moscow and Konisk Railway, by reason of the increasing movement of passengers over the line, and the development which it is likely to acquire in an early future. It is proposed to construct as soon as possible a line to unite Brody and Koons, via Radzivilow and Doubus; this line will be prolonged as far as the Austrian frontier. Delegates from an association of Siberia merchants have obtained authority to execute surveys for determining the route of a line between Tumere and a point on the Kuma.

The Minister of Ways of Communication is also elaborating a project for a network of secondary lines intended to feed the great lines already constructed or in execution or contemplation. The branches will be constructed with only a single line, and only the most indispensable works will be executed upon them. We might continue these details; but we have cited sufficient facts to show the well nigh boundless future which is being opened out by railway projectors in the enormous territories of the Czar,

The extent of railway in operation last year in Russia was 4,050 miles, of which 1,062 miles were state lines, the balance being in the hands of companies, whose capital is guaranteed by the Russian treasury, after the Anglo-Indian fashion. In the course of the current year, 1,375 additional miles are expected to be brought into operation, so that at the close of 1869 Russia will have 5,425 miles of effective railway. Considering, however, the immense extent of the Russian Empire, it is obvious that the present railway facilities of Russia are totally inadequate, and that the Russian Government is quite justified in pushing on the construction of additional lines by all the means in its power.

The lines which will be brought into more or less complete operation this year will be those from Komok to Kirw and Balta; from Balta to Krementschug; from Balta to Volotchisko; and from Vitebsk to Oul, via Smolensk. A great line from Komok to Taganrog via Charskoff, upwards of 600 miles in length, is expected to be brought into use in 1870; in which year other additions will be made to the Russian network effectively in operation, as the guarantee given by the Russian Treasury, coupled with the tolerable and increasing

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Russian coal.

receipts realised on the lines themselves, has removed all difficulties incidental to the provision of the necessary capital. We believe that the next ten years will witness the establishment of 10,000 miles of new railway in Russia, provided always that the empire does not become entangled in some continental war.

ARCTIC OCEAN.

At Byam Martin's Island coal formations exist, and at Melville Island several varieties of coal have been discovered, much of it being of an anthracitic or of a semi-anthracitic character. We learn that at Prince Regent's Inlet indications of coal have been observed.

GREENLAND.

Captain Scoresby discovered a regular coal formation here. At Hasen Island Bovey or brown coal has been found, and also at Disco Island on the western coast.

SWITZERLAND.

Switzerland.

Coal has only been found in the cantons of Berne, Fribourg, and Valais.

Anthracite, more like graptolite than coal, has been found in the Central and Western Alps. A recent analysis of this gives carbon 88·16, hydrogen 2·15, oxygen and nitrogen 1·34, carbonic acid 4·29.

Real coal has only been found in the cantons named.

The principal mines in Berne are those in the Obersimmenthal, near Schwarzenmatt, Langel, Klus, &c. They appear to produce on an average about 525 tons. In the year 1845 the yield was 810 tons. Pitch coal was found in Emmenthal in 1862; the seams are very thin, and are worked only for local use.

In the canton of Fribourg the contiguous coal mines of Semsales, Bogens, and St. Martin were conceded in 1776 to two individuals. The coal was used in glass works, and for this purpose it is still employed. Only one seam is actually being worked, and that with a shaft of 200 feet deep, and with a steam engine. The coal is a good lignite; the annual produce is given at 3,100 tons. Mr. Dering in his consular Report says,—"I have just heard that a company has been formed with a capital of 20,000*l.*, to reopen the large beds of anthracite coal in the canton of Valais."

The mines of Utznach and Mörschyl, in the canton of St. Gall, are reported to yield 12,000 tons per annum. The import into Switzerland of coal from France, Germany, and Austria, and of peat from Italy, the last being in very small quantity,—

Was in 1860	-	151,398 colliers of 1,500 lbs. avoirdupoise.	
1861	-	213,870	„ „
1862	-	235,435	„ „
1863	-	236,310	„ „
1864	-	288,501	„ „

ITALY.

Italy.

The principal coal mines of Italy are in Savoy and near Genoa. In the Apennines some coal is found, and in the valley of the Po are large deposits of good lignite, and a small quantity of good coal is worked in Sardinia.

Anthracite is said to be found in the valley of Aosta. We suspect this is not a true anthracite. Lignite is abundant. The following brief notices are all that are required respecting this unimportant coal producing country.

Leffe Gandino, in the Val Seriana in Lombardy, is an extensive bed of lignite, much resembling good peat. The price at the pit's mouth was in 1864 15 francs per ton.

Cadibona, near Savona in the Gulf of Genoa, has been worked for some years, producing usually about 1,000 tons per annum. In 1855 its production rose to 20,000 tons, but in 1861, and since, it has produced the lower quantity only.

Sarzanella near Spezia. About 36,000 tons of lignite are annually produced. It is a good lignite, and is used in smelting lead ore.

In the Tuscan Maremma are the following lignite mines:—

Monte Rufoli, Monte Bamboli, and *Monte Massi*.—The production from these mines does not exceed 10,000 tons a year.

Lama is another mine in this district, yielding when worked from 30 to 40 tons a day. It is used in foundries, forges, and kilns.

Briatico.—Calabria; occasionally worked. Some true coal is reported as having been found on this coast, but nothing reliable can be obtained respecting it.

Gonessa, on the south-east coast of Sardinia, is worked on a small scale.

Podnernuovo, near Volterra, produces lignite, which is thus described by Mr. E. J. Beor. He states that the deposit of lignite at Podnernuovo, near Volterra, is of lacustrine origin, and consists of two parallel strata of compact coal about 2½ metres (= 8 feet 4 inches) in thickness, separated by a thin stratum of marl, with marsh shells. The lower coal-bed lies on a bed of marl with marsh shells, and the upper bed is covered by a marine formation belonging to the Upper Miocene. The lignite comes to the surface near the Alberese, where it extends for a considerable distance. Some shifts occur bringing the upper bed down nearly to the level of the lower one; the inclination of the beds diminishes gradually, and the intervening stratum of marl decreases in thickness, and probably at last thins out altogether. The coal in the upper bed is better than that in the lower one. Mr. Beor remarks that this lignite deposit differs from those of the neighbouring valleys in being purely of marsh origin, while they are estuarine.

The French Journal, *Les Mondes*, for 16 April 1868, says, a company is formed at Naples for working coal in the Neapolitan Provinces.

Experiment has demonstrated the excellent quality of this coal, and of the gas made from it.

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VENICE.

Venice. Imports of coal.

Imported from United Kingdom. Coals of the value of—

1862.	1863.
£72,466.	£54,435.

The total value of coal imports was—

£154,237.	£142,127.

The value of "coals and other fuel" exported—

£4,814.	£7,463.

Of lignite, Valdagno produced 6,641 tons in 1863. Two establishments were erected for the distribution of petroleum from bituminous schists.

SPAIN.

Spain.

Spain contains a large quantity of coal untouched, both bituminous and anthracite. The richest beds are in Asturias, and the measures are so broken and altered as to be worked by almost vertical shafts through the beds themselves. The Asturias Mining Company are working many mines in this region, and they are said to produce 100,000 tons annually, or, more correctly speaking, they are supposed to be capable of doing so. The Asturian Coal Company possess at present 94 concessions, 31 of which are at work, producing 78,307 tons of coal, of which 25,000 tons are consumed by the iron founders. In one place upwards of 11 distinct seams have been worked, the thickest of which is nearly 14 feet. The exact area is not known, but it has been estimated by a French engineer that about 12,000,000 of tons might be readily extracted from one property, without touching the portion existing at yet lower depths. The whole coal area is said to be the largest in Europe, presenting upwards of 100 workable seams, varying from 3 to 12 feet in thickness.

In Catalonia and in the Basque provinces of Biscay there is fonnd anthracite and bituminous coals.

In the Balearic islands also coal exists.

The government returns are made up for the provinces, and from these the following information is obtained.

Oviedo.—This province furnishes more than any other. In 1860 the return was 279,428 tons, and in 1863 307,396 tons.

Leon, Districts of Valderrueda, Sabero, Matellana, Otero, Valdesamario, and *Vierzo.*—The Leon works produced, in 1860, 6,200 tons; in 1863, 6,791 tons.

Palencia and *Burgos.*—The produce of three sets of mines is said to equal 160 tons a day, or, according to the government return, Palencia produced in 1860, 21,765 tons, and in 1863, 60,670, which Burgos gave only 1,449 tons in the former year, and 2,256 tons in the latter.

Gerona.—The coal here is chiefly worked for making coke, and it is used for railway fuel; the quantities officially reported are 1,800 in 1860, and 2,267 in 1863.

Sevilla produced in 1863, 9,016 tons. There is, however, but little doing in this province.

Cordoba gave in 1860, 8,300 tons of coal, and in 1863, 12,901 tons.

The Provinces of Barcelona, Lerida, Balearic Islands, Santander, Guipuzcoa, Alva, and Alicant, Saragosa and Gerona, produce between 17,000 and 18,000 tons of lignite annually.

In the vicinity of the River Caudin is a coalfield belonging to the Duchess of Leuchtenberg; it consists of 43 concessions, 20 of which are at work, the produce of which is said to be over 30,000 tons. The Santa Ana Company has 17 concessions at work, producing about 40,000 tons. A Belgian Company has 14 concessions, producing 5,000 tons. La Justa Company extracts 9,500 tons, and there are numerous other small concessions which are said to produce more than 100,000 tons. This information is derived from the Report on *the coal produce and trade of Spain,* furnished to the Foreign Office by Mr. L. S. Sackville West.

PORTUGAL.

Portugal.

Beds of lignite and some anthracite coal are known to exist, but the production of either is small. The production per annum is—

	Tons.
San Pedro de Cova - - - -	11,786 coal.
Coimbra - - - -	2,946 lignite.

In the district of Leiria there are mines producing coal, but the workings are very insufficiently developed. There are also in the district of Areiro, at Monte dos Canadinhas, Pÿâo, and Pedorido some anthracite mines, the value of which, however, is very insignificant.

GREECE.

Greece.

There is no coal, properly so called, known to exist in Greece, but lignite has been found in several places.

It exists in considerable quantities at Oropo and Marcopoulos to the N.E. of continental Greece; at Limni on the Argolic coast; on the Isthmus of Corinth; in the neighbourhood of Kalavryta, and especially at Koumi in the Eubœa.

Mr. Jenner, the British Consul, who reports to Mr. Erskine, says,—"The lignite found would not be "to any extent available for the use of ships, owing to the small amount of caloric it evolves in pro- "portion to its bulk. For manufacturing purposes, for distilleries, and for iron working, as well as for "use in houses as a combustible, it might be profitably employed, as it is calculated that, including "the expenses of transport to the nearest large port, it might be sold at from 12*s.* to 15*s.* a ton.

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" English coal costs from 35*s.* to 45*s.* a ton. Supposing the Greek lignite to contain on an average " about half the caloric power of English coal, the former might be advantageously substituted for the " latter in all cases where its bulk would not prove an insurmountable obstacle."

TURKEY.

Turkey.

Coal is found bordering on the Carpathian mountains, in Servia, Roumelia, and Bulgaria.

The coal of Heraclea (Eregli), on the south coast of the Black Sea, in Anatolia, has been, since the Crimean war, exciting much attention.

In 1853 a Government return gives a letter from the Rev. John C. Barkley, who says,—"Two of " my sons have been engaged by the Turkish Government to open mines on the Asiatic coast of the " Black Sea, about 30 miles eastward of Erekli, or 150 miles from the mouth of the Bosphorus, at " which at that time there were 30,000 tons ready for shipment."

Commander Spratt, of the "Spitfire," says,—"Coal is found in almost every valley opening to the " sea, from about five miles north-east of Heraclea as far as Amostros, and at distances of from one " quarter to three miles from the shore. The chief locality for good coal is at the valley of Kosloo, " about 16 miles north-east of Heraclea. In this valley of Kosloo there are no less than nine seams of " coal, but four only are worked. 300 tons a day can be shipped, weather permitting. About 30,000 " tons per annum are said to be obtainable from these seams."

Mr. Longridge states, in 1854, that the mines are capable of producing, if properly worked, as follows:—

Kosloo - - - -	30,000 tons per annum.
Armoot-Ichuk - - -	5,000 „ „
Balluk - - - -	2,500 „ „

The amount of stock on hand at that time was,—

	Tons.
At Kosloo, Armoot-Ichuk, and Balluk, the quality of which may be depended on, being worked under the superintendence of Mr. Barkley - - - - - - - -	4,000
At various places worked by Croats, the quality not to be depended upon - - - - - - - -	15,000
At Heraclea, in heap or depôt, quality not to be depended upon, being mixed from all the mines - - - - - -	4,000
Total estimated stock - - -	23,000

The 2nd Report of the Ottoman Imperial Scientific Commission on the Universal Exhibition of 1867 says,—The situation of Eregli, in Anatolia, on a gulf of the Black Sea, is favourable for working the coal, and for coaling steamers.

The coal of Eregli resembles Newcastle coal in composition; inflammable, free-burning, tolerably pure, and suitable for the manufacture of coke. The advantages of this Black Sea coal is dwelt on, as, in the Levant, all coal comes from England, and costs from forty to forty-five francs per ton.

The reporter:—

"The coal basin of Eregli is the first to attract attention. There are other deposits in the Ottoman Empire; but they are not well known, and becoming known they could only be worked after the creation of means of communication; that is, after a certain lapse of time; but this is not the case *with Eregli.*"

SMYRNA.

Moderately good coal is found at Nazli, near Olidin. There are other coal mines of very inferior quality.

SERVIA.

Coal of an inferior description is to be found in many parts of Servia. At Kupria, on the Morava, much brown coal has been discovered. There is a good deal of lignite coal at Golumbatz and Bernitza. At Dobra, not far from the Danube, extensive coalfields have been discovered. Considerable seams of lignite coal have been opened at Brza, Palauka, and Negotin, and in many other places of the interior.

INDIA.

Coal of India.

From the Memoirs of the Geological Survey of India we extract the following anthracitic information:—

PRODUCTION OF COAL IN INDIA.

Districts.	1858.	1859.	1860.
Runnigang Coalfield -	5,917,000	8,949,600	8,559,097
Rajmahal Hills - -	219,000	843,000	1,222,860
Kurhrbari - -	4,000	108,182	275,256
Palamow - - -	—	28,648	30,900
Syhlet Hills - -	22,319	32,498	—
Total in Mannels -	6,162,319	9,961,928	1,088,113
Or in Tons - -	226,140	365,575	370,206

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The East Indies.

Of the Singrowli coalfield, which lies to the south of the river Sone, in the Rewah territory Dr. Oldham states that he has not been able to procure any return, but that he is aware that the amount of coal raised has been small, and will not affect the general total. More than one bed of coal has been practically examined in the continuation of this field to the west and towards Singapoor; but none of these are as yet at work as collieries. The Nerbudda Valley has long been known to contain coal, but owing to the distance from any available market, and the comparative inaccessibility of the localities where it occurs, it has not been hitherto economised. The Nerbudda Coal and Iron Company have this year commenced their operations, and I suppose will shortly be turning out coal.

In other parts of the north-western provinces' territory there is no known workable coal. Seams of lignite of very irregular size and very limited extent occur in several places along the foot of the Sub-Himalayas, marking a certain group of sandstone rocks, of comparatively recent date; but nowhere are these deposits known to be of extent rendering it probable they will ever be of any practical use.

In Oude no coal is known to occur. In the Punjaub no coal is known to occur, if we except as above, in the north-western provinces, the patches of lignite which have been found in several localities along the base of the outer Himalaya, as well as in the Salt Range.

In Scinde the only coal raised was that of Synah Valley, as given above; but the irregularity and the small extent of this deposit has caused it to be abandoned. It was, in fact, an irregular patch of *lignite*.

In Bombay no coal is known to occur. In Hyderabad none. In Nagpore a small coalfield is known, near to Muret, on the border of the Nerbudda district, which may, in fact, be considered in continuation (although actually separated) of the Nerbudda deposits. The coal is not now economised.

In Madras no coal is known. Coal has been more than once stated to occur on the Godavery, or some of its feeders, and even very recently; but as yet nothing but black shales, which will not support combustion, and which are in all probability of a totally different age from the coal-bearing rocks of India, have been met with.

In the Report of 1869 Dr. Oldham gives a table of the total coal produce of India for 11 years. He says,—"So far as known, the total annual out-turn of good coal in India during 11 years is shown. I "have given also in this table the quantity raised in Bengal alone, as compared with the whole of "India, and the quantity imported into Calcutta for the entire series of years. The two latter columns "taken together give the total quantity of coal required to meet the consumption of Calcutta, and of "places supplied from Bengal. This quantity it will be seen amounted in 1867 to 12,993,912 maunds, "or 476,841 tons, and in 1868 to 15,394,420 maunds, or 564,933 tons."

	Coal raised in all India.	Coal raised in Bengal.	Coal imported into Calcutta.	Total Consumption of Bengal.
	Maunds.	Maunds.	Maunds.	Maunds.
1858	6,162,319	6,162,928	—	—
1859	9,961,928	9,961,928	1,229,160	11,191,088
1860	10,088,113	10,008,113	496,585	10,584,698
1861	7,806,252	7,785,085	1,285,203	9,070,288
1862	8,643,843	8,630,843	676,687	9,307,530
1863	9,512,174	9,504,975	1,036,407	10,541,382
1864	9,046,147	9,032,405	1,818,132	10,850,537
1865	8,837,953	8,810,425	1,616,143	10,426,568
1866	10,834,551	10,790,035	914,427	11,704,426
1867	11,861,031	11,847,178	1,146,734	12,993,912
1868	13,562,274	13,465,829*	1,928,591	15,394,420

From this table it appears that the total quantity of coal (so far as tabulated) raised in all India during the year 1867 was 1,18,61,031 mds., or 479,233 tons, and in the year 1868, 1,35,62,274 mds., or 547,971 tons. It is worthy of notice also that of this large quantity only 13,753 mds. were obtained from any other field than that of Ranigunj in the year 1867, and only 1,11,445 mds. in the year 1868. Nothing can more forcibly show the vast importance of this one coalfield.

A simple inspection of the figures given above will show that, with some fluctuations, the amount of coal raised in this country has during the 11 years past increased rapidly, and on the whole steadily, from 61½ lakhs of maunds in 1858 to 127¼ lakhs of maunds in 1868. In other words, the quantity has considerably more than doubled during the lapse of ten years. If we go back still further, we find that in 1850 the total quantity sent away from the Ranigunj field was 22 lakhs of maunds; while in 1868 this out-turn had grown to 126 lakhs, or nearly six times the amount. Few industries can point to such an extension within the same number of years.

COAL RESOURCES OF INDIA.

1. Rajmahal Hills.—In this district coal deposits occur in many places. In the basin of the Brahmini, four or five seams are known, varying in thickness from 3 to 12 feet. In the valley of the Bansloi stream further north, several valuable beds of coal also occur, and in the Goomani Valley, and towards the north-western end of the hill range near Borah. While the East Indian Railway was being constructed, many of those beds were worked; but since the opening of the line very little has been done. This railway should have opened a trade from this coalfield to Calcutta.

2. Raneegunge.—This coalfield is at a distance of 120 to 160 miles N.W. of Calcutta. Its greatest length being nearly E. and W. about 30 miles, and the greatest breadth nearly N. and S. about 18 miles. The area of coal-bearing rocks is about 500 square miles.

* This includes the produce of Assam.

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The East Indies.

The coal of this field is a non-coking bituminous coal, composed of distinct laminæ of a bright jetty coal, and of a dull more earthy rock. The average amount of ash is some 14 or 15 per cent., varying from 8 to 25 per cent.

The Raneegunge coalfield has the advantage of two branches of the Indian Railway, which traverse its richer portion. Professor Oldham has estimated that 14,000 millions of tons are fairly obtainable from this coalfield.

3. KURHURBALI.—Situated N. of the river Barakur, about 80 miles S. of the Luckieserai station of the East Indian Railway. Its greatest length is 6¼ miles; its breadth nowhere being more than 2¾ miles. There are several beds of good coal from 8 to 14 feet thick. The coal of Kurhurbali is of better quality than most of the Indian coal. Its distance from the railway has operated against the opening out of this coalfield. After carefully excluding one fourth for loss, waste, &c., it is estimated that 168 millions of tons of coal remain in this field.

4. JHERRIA.—This coalfield extends along the valey of the Damudah river. Its greatest length is 21 miles, in an E. and W. direction; its maximum breadth is about 9 miles N. and S. Total area 200 square miles. It is roughly calculated that this field would yield 465 millions of tons.

5. BOKARO.—This coalfield is but a mile west of the Jherria coalfield. It extends along the valley of the Damudah, forming a long narrow band of coal-bearing rocks of more than 40 miles from E. to W.; its breadth N. and S. never exceeding 7½ miles. It is a poor coal, used only for brick and lime burning; but much has been raised and carted to Hazareebagh, and even to Gya. It is estimated that 1,500 million tons of coal are in this field.

6. RAMGURH.—This small field occupies a triangular space. Near Ramgurh the breadth in a N. and S. direction is only a few hundred yards. It extends eastward about 12 miles, and at the eastern end expands to a breadth of 6 miles. Available coal 2 or 3 millions of tons.

7. HOHARO or KARUNPOORA.—The field is of large extent, covering a surface of at least 450 square miles. The South Karumpoora field is thought to occupy 120 square miles. These fields are poor in coal, and what does occur is of inferior quality.

8. EETCOORA.—Near Eetcoora, to the N.W. of Hazareebagh, coal occurs of poor quality, but usable for brick and lime burning.

9. PALAMOW.—The principal fields of coal occur along the valley of the Damudah and its tributaries. The actual limits of the field have not been determined, but the district is poor in coal, and if worked it will only be so to supply local demand.

10. SINGROWLIE.—Not far to the west of the village of Singhpur the colliery of Kotah has for years been known, and a fair amount of good coal has been produced. Coal exists in eight or nine localities, spreading over an area of about 40 miles in length from E. to W., and 20 in breadth from N. to S. No details can be obtained.

11. UPPER SONE.—The prospects of any large amount of coal being available from this district are not good. Some thin seams, apparently unworkable, were noted by the Geological Survey in the Mahanuddy Valley, near the district of Bijiragoogurh.

12. HUTSOO or CHUTTEESGURH.—Coal occurs in the Hutsoo near Koorba; in the Beeja Kurra, 25 miles N.W. of Koorba; and in the Labed, a few miles further in the same direction. It is said to extend 200 yards along the bed of the former, and about a mile in the latter. Coal was also found in the Chornai stream, a tributary of the Hutsoo.

13. TALCHEER.—There is but little coal in this field, and that little poor in quality. The total area of the coal-bearing rocks in the field is not more than 10 square miles.

"These coalfields, in conjunction with the reported coalfields near Chanda, on the Wurda, and also the reported coalfields in the vicinity of Sumbhulpór, will in a very few years become of far higher value than they are now." *Oldham.*

This opinion appears to be founded on the probability of the formation of a line of railway from Calcutta to Bombay. The Nerbudda Coal and Iron Company have their works near Mopani, and effective preparations are made for working the coal as soon as the Great Indian Peninsular Railway to Jubbulpur is opened. The coal does not appear to be of a high quality, but still it is of considerable local importance. Many small thin seams exist in several localities within Tawa Valley of the Nerbudda district, but they are unimportant.

14. PENCH RIVER.—Coal occurs at Sirgori village. One seam was more than 4 feet thick, and another seam 2 feet thick. (2.) Chenda or Digawani.—A seam with more than 12 feet of coal. (3.) Hurrye.—A seam; thickness unknown. (4.) Rawunwarra.—One seam with 5 feet 4 inches of coal. A second with more than three feet of coal. (5.) Parassia.—Above 5 feet of coal. (6.) Bhundaria.—Seam of 15 feet 2 inches, with more than 7 feet of good coal. (7.) Pootaria.—More than 5 feet of good coal. (8.) Burkoi.—About 6 feet of good coal. (9.) Gogri.—Six feet seam, with 5 feet of coal.

This coalfield is nearly 100 miles from Nagpoor; and this distance prevents any profitable working. Coal has only been raised from one seam, that at Burkoi. Since 1860 one colliery has been held on lease; but little has been done, owing to the cost of bringing the coal to a market for it.

15. CHANDA.—No details are given. We have only the statement that coal occurs.

16. KOTA.—Near Kota, on the Godavery, coal has been more than once reported.

17. CUTCH.—The coal occuring at Cutch affords no hopes of proving valuable.

18. SIND.—There is coal; but "as a source of fuel it was therefore utterly worthless."

19. SALT RANGE.—"The Salt Range may, therefore, in my opinion be rejected from all calculation " of the available supplies of good coal in India, excepting for immediately local demands, and for such " common purposes as this inferior coal may suit."

20. MURREE, &c.—Patches of coal and lignite only.

21. DARJEELING.—Coal-bearing rocks near Punkabaree, at the foot of the Darjeeling Hills, and nests of coal and lignite.

22. ASSAM.—At Terap a minimum thickness of 5 feet of clean bright coal was seen. At Namchik, a tributary of the Deehing, within 200 feet in length, 3 thick beds of good sound coal were seen; one of them 8 feet in thickness. At Jaipur a seam of 17 feet occurs, of which 10 feet is good coal. Several

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The East Indies.

other seams exist; but from the inaccessible nature of the country it is not possible to obtain an approximate idea of the amount of fuel available. "It can, however, be unhesitatingly asserted that "this amount is very large and most valuable."

23. KHASI HILLS.—Good coal occurs, especially well adapted for making gas. Professor Oldham estimates the available coal of the Khasi Hills at 3,000,000 tons. "It is not improbable that double "this quantity will prove to be near the true amount."

24. Coal measures exist at GARO HILLS; but the Geological Survey failed to find any coal. At (25) CACHAR small pockets of coal occur. Similar examples occur at (26) CHITTAGONG. In the island of (27) CHEDUBA a lignite is met with.

28. BURMAH.—In British Burmah no workable coal is known to occur. In Upper Burmah some irregular beds of inferior coal were examined by Dr. Oldham. "They hold out no prospect of supply- "ing anything more than a very local and limited demand, and even this with inferior fuel."

29. TENASSERIM.—"Beds of coal near Mergui, in the Tenasserim provinces, were examined by me "in 1854. They hold out little prospect of affording a large supply, while the coal is of inferior "quality."

Coal of India.

COAL DISTRICTS of INDIA, with their AREAS, and estimated COAL CONTENTS.

	Coal area in Square Miles.	Estimated quantities of coal remaining.
		Tons.
1. Rajmahal Hills	—	—
2. Raneegunge	400	14,000,000,000
3. Kurhurbali	10	168,000,000
4. Jherria	200	465,000,000
5. Bokaro	100	1,500,000,000
6. Ramgurh	30	3,000,000
7. Hoharo and	450	Unknown.
Skarunpoora	120	Do.
8. Eetcoora	—	Do.
9. Palamow	—	Do.
10. Singrowlie	—	Do.
11. Upper Some	—	Do.
12. Hutsoo	—	Do.
13. Talcher	10	Do.
14. Pench River	—	Do.
15. Chanda	—	Do.
16. Kota	—	Do.
17. Cutch	—	Do.
18. Sind	—	Do.
19. Salt Range	—	Do.
20. Murree	—	Do.
21. Darjeeling	—	Do.
22. Assam	—	Do.
23. Kassi Hills	—	6,000,000 (?)
24. Garo Hills	—	Unknown.
25. Cachar	—	Do.
26. Chittagong	—	Do.
27. Cheduba	—	Do.
28. Burmah	—	Do.
29. Tenasserim	—	Do.
Estimated total quantity of coal in the coal areas estimated above		16,142,000,000

According to the Report by Dr. Oldham, the Assam coalfield must be regarded as the most important amongst those of which the coal areas cannot be satisfactorily ascertained. The inaccessible nature of the country renders it impossible to obtain an approximation to the value of its coal formations, and from its situation, supposing some local industry leads eventually to the development of its native resources, the coal of Assam can never come into competition with the fuel of other countries.

In the following pages the quantities of British coal sent to the principal ports in India are given. From this it will be seen that—

Even supposing that the 16 thousand millions of tons estimated by Dr. Oldham represents the total supply of coal that can ever be expected to be produced by the Indian coalfields, that is a quantity sufficient to meet a greatly increased demand for a very long period; and therefore we are not in any way justified in supposing that the East Indies will ever require much more coal from Great Britain than that which it now receives.

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East Indian coal.

THE PRODUCTION OF COAL IN INDIA FROM 1858 TO 1866. Compiled from Dr. Oldham's Report.

Name of Coalfield.	Number of Collieries.	Number of Pits or Quarries.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
			Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
RANIGANJ.											
Singàran Valley - -	22	43	32,220	86,994	80,792	83,060	105,191	104,222	114,561	124,162	169,313
Raniganj - -	11	31	131,119	172,697	171,261	153,882	166,727	184,778	163,838	168,521	190,766
Núnia Valley, E. - -	13	26	17,064	21,284	17,348	467	3,736	7,106	11,649	14,217	17,345
,, W. -	5	16	9,908	11,743	10,642	—	—	13,353	20,417	9,546	11,501
W. of the field and others	9	16	26,825	32,036	34,051	30,148	30,532	41,649	24,807	9,859	10,704
RAJMAHAL HILLS.											
Brahmini Nuddi -	7	11	8,000	31,222	45,217	—	—	—	—	—	—
Bansloi Nuddi - -	7	7	1,000	3,583	3,000	2,367	1,641	11	—	—	—
Goomani Nuddi -	3	4	3,703	5,550	9,555	—	—	—	—	—	—
N.W. of Hills - -	3	4	3,703	1,500	29,111	—	—	—	—	—	—
Kurhurbari - -	1	7	148	4,006	10,193	9,766	10,209	940	—	—	..
Palamow - - -	1	—	148	1,061	1,144	1,234	1,621	—	—	—	—
Khasia and Jynteah -	2	—	863	1,023	1,144	598	—	—	—	—	—
Singrowli and Rewah -	2	—	863	1,023	1,444	185	481	259	148	—	1,108
Scinde, Lynah Valley -	1	4	—	1,680	—	—	—	—	—	—	—
Salt Range - -	—	—	—	—	—	—	—	7	360	1,019	540

COAL RAISED IN INDIA. The original returns are given in Bengal maunds = 40 seers each = 2,057 lbs. These have been brought into the English statute tons.

	All India.	Produce of Bengal.	Production of other parts than Bengal.
	Tons.	Tons.	Tons.
1858	238,241	—	—
1859	374,379	368,960	5,419
1860	374,998	373,633	2,365
1861	289,120	288,336	784
1862	320,142	31,9660	482
1863	354,203	352,036	2,167
1864	335,783	334,533	1,250
1865	327,517	326,312	1,205
1866	401,279	399,630	1,649

The above figures show that within the last nine years but little progress has been made in the development of the coalfields of India. The coalfields of Bengal are the only ones which have been worked in anything approaching to a systematic plan, and even in these there appears to have been a want of any well regulated method. There can be no doubt that, if there should spring up a large demand for native coal, there would speedily be an increased production of it. Still, since 1861, we have given us by Dr. Oldham, from the East India Railway's Deputy Agent, a return of the coal used on that line, which is as follows:—

	Tons.			Tons.	
1861 - -	36,711,	leaving of coal raised in	Bengal	251,625	for other uses.
1862 - -	45,544	,,	,,	274,116	,,
1863 - -	68,063	,,	,,	283,973	,,
1864 - -	99,868	,,	,,	254,665	,,
1865 - -	104,739	,,	,,	221,573	,,
1866 - -	188,133	,,	,,	211,497	,,

From this we see that as the locomotives of the railway have been burning more Indian coal, the increased supply from the Bengal collieries has not kept pace with the demand, and in each year since 1863 there has been a steady decline in the quantity of native coal left to meet the requirements of the country.

Dr. Oldham tells us, "That during the last eight years there has been an aggregate consumption of "coal supplied for Bengal alone and the port of Calcutta, of more than 3,000,000 tons, of which about "eight ninths were raised in India, and about one ninth imported; that there has on the whole been "but little increase in the demand for coal during that period."

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On the Coalfields of the Central Provinces.*

East Indian coal.

The Government of India, assured by competent authorities of the existence of a valuable coalfield in the Central Provinces, determined upon procuring from England the best apparatus, in order to test the extent of that field. Certainty is so nearly attained that a light line of railway is already spoken of through the Hingunghat district down to the coalfield of Chanda. Chanda possesses at least one compact bed of this mineral, containing, according to moderate calculation, eighteen million tons. In all probability as much again may be found on the Berar side of the river; and it is believed that seams of no mean size exist elsewhere in the neighbourhood. In the latter part of 1865 Captain Lucie Smith, Deputy Commissioner of Chanda, was engaged collecting the clays of Chanda. In the search for clay, Captain Smith came upon a piece of coal shale in the bed of the Wurdah; he accordingly instituted a search for the larger rock of which it was a fragment. Some distance up the stream a hole was discovered in the left or Chanda bank, from which the shale had evidently been washed. A shaft was sunk, and coal reached at no great distance from the surface. A search in the neighbourhood disclosed also a patch of coal, cropping up in a ravine on the right or Berar side of the stream. In February 1866 another seam was discovered on the Berar side, near a place called Bullapore. Specimens obtained near the surface, and inferior in quality to that more deeply embedded, were analysed in Bombay, and pronounced scarcely inferior to Chindwarra coal, and to possess calorific value equal to about two thirds that of good Welsh. To continue this test, a cartload of it was sent to Nagpore to be tested by an officer who was reputed to be an authority in this and kindred matters. Cleavage, fracture, lustre, hardness were all considered, and it was pronounced not to be coal at all; but in April 1867 Mr. W. T. Blandford, of the Geological Survey, visited those parts, and reported on the Koombaree, Googoos, and Bullapore seams. The first gave an authoritative decision that Chanda possessed coal; the Nagporean to the contrary notwithstanding. The first two beds he considered probably limited, but pronounced that at Bullapore highly promising, while an analysis made at Calcutta showed the coal to be of good quality. Captain Smith found another seam in March 1868 on the right bank, near a village known as Latee, the coal of which was unmistakeably good. Two months later a boring machine was set to work to ascertain the probable thickness of these beds. At Chanda the coalbed was reached, 20 feet of coal and carbonaceous shale were passed through, afterwards a few feet of clay, and then another bed of excellent coal over 11 feet in thickness. Mr. Binnie, executive engineer in Chanda, reported upon the boring made at Googoos, as also upon the appearance of the Koombaree and Bullapore seams. These he did not consider to be mere isolated patches; everything seemed to prove them the outcrops of an extensive bed.

Mr. Mark Fryar, mining engineer in connexion with the Geological Survey, being deputed by the Survey to carry on these explorations, submitted his first Report in February last. He counselled the immediate commencement of mining operations on a large scale, and the construction of a branch railway to Chanda. Mr. Medlicott, deputy superintendent, differed from Mr. Fryar on some points, as to the extent of the coal-bearing strata. So Mr. Fryar reported fully in April last, justifying the opinion he had previously expressed. Mr. Morris, the chief commissioner, was not yet persuaded that the time had come for the prosecution of mining enterprise on a large scale; but he thought sufficient information had now been obtained to warrant him in recommending the construction of a light line of railway through the cotton and coal-producing country of the Wurdah Valley, as also a moderate expenditure for the procuring of the best boring machines from England, Mather and Platt's for instance, and for completing as accurate a survey of the whole district as may be considered needful.

Googoos.—Near the village of Googoos, on the left bank of the Wurdah, Captain Smith, as before mentioned, sunk a shaft, and the section shows 14 feet of workable coal to a depth of 24 feet 1 inch. This shaft is on the Chanda side of the river, but the seam has been cut through on the Berar side as well, and traced to a considerable distance, indicating a field of great depth and area.

Bullapore.—There is a very promising bed of coal presenting itself in the Wurdah, on the Nyamj-side, but dipping into the Chanda district. The exposed bed being cut, 7 inches of shale and 6 ft. 4 in. of coal were found. From the position of this bed any estimate made from what can actually be seen must, Mr. Fryar considers, be an under estimate. This coal seam can also be traced along the line of its outcrop for some distance, proving that it was no isolated patch, but a regular normal bed, as likely to continue with its associated rock as any in India; as the Raneegunge beds, for instance.

Latee.—Near Latee a cutting on the river's edge displayed about 6 feet of coal and shale, the quality being apparently equal to that of the Bullapore seam. Coal has been found at other places in like quantity, and under such conditions as to leave no doubt in Mr. Fryar's mind that they continue as workable beds over a large area. The carboniferous sandstone strata extend over a tract of country 75 miles in length, and varying from 8 to 22 miles in breadth; in other words, over an area of 900 square miles. Over the whole of this, therefore, there are grounds for believing the coalfields likewise extend. It would be premature to enter upon any closer calculation regarding these beds at present. Sufficient is known to warrant the fullest research, and likewise the confident belief that the result of the measures of investigation recommended by Mr. Morris, and approved by the Government of India, will be more gratifying than is expected. If such is the case, the construction of the light line of railway must immediately follow.

Chanda Coalfields.—We learn that the boring operations now being carried out in the Chanda coalfields are attended with the most encouraging results. One coal seam has, it is said, been discovered, 30 feet in thickness, of such an extent that it alone could supply fuel to all the railways in India for half a century to come.

* This information is abstracted from a communication to the Mining Journal in 1869, from a most competent mining engineer.

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East Indian coal.

COAL exported from INDIA during the under-mentioned YEARS.

	Bengal.		Madras.		Bombay.	
	Total Quantity.	Value.	Total Quantity.	Value.	Total Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£
1853	—	—	—	—	185	248
1854	—	—	—	—	330	847
1855	—	—	—	—	130	310
1856	—	89	—	—	—	—
1857	—	—	—	—	—	201
1858	—	2,400	—	—	—	—
1859	84	257	—	—	100	200
1860	105	213	240	240	—	—
	cwts.		cwts.		cwts.	
1861	806	40	2,040	206	16,340	1,679
1862	2,291	109	60	9	6,700	612
	Tons			tons.	tons.	
1863	—	—	148	246	2,917	9,091
1864	234	314	682	1,183	690	1,342
1865	—	—	148	246	949	6,253
1856	4,408	5,903	13	20	2,060	4,370

The consumption of coal on the railways of India is very large. The amount supplied for the use of the locomotive department alone on the East Indian Railway, independently altogether of coal used for other purposes, have been as follows:—

	Maunds.		Maunds.
1861 - -	991,219	1864 - -	2,696,442
1862 - -	1,229,709	1865 - -	2,827,953
1863 - -	1,837,717	1866 - -	5,079,612

"We have taken the East Indian Railway here as being by far the largest single consumer of Indian coal; but similar results would follow from a consideration of the consumption on other lines of railway."

The following return will convey some idea of the quantities of coal sent to India for the use of the railways.

STATEMENT of COALS, COKE, and PATENT FUEL shipped from ENGLAND for the use of the MADRAS RAILWAY in the YEARS 1864, 1865, 1866, and 1867.

1864.

Coal.	Tons.	Coke.	Tons.
Cowpen Hartley - -	1,170	Brancepeth - -	872
Garswood Park -	1,009	Pease's West - -	100
Whitworth Hartley -	99	Tanfield - - -	50
Coed Talon - -	1,065		
Cowpen Hartley -	221		
Thomas Merthyr -	1,828		
Welsh Hartley - -	651		
North Wales - -	300		
Total - -	6,343	Total - -	1,022

1865.

Cowpen Hartley - -	3,985	Brancepeth - -	3,584
Squborwen Merthyr -	750	No. 3 Rhondda Valley -	2,698
Garswood Park - -	1,239	Marley Hill - -	75
Welsh Hartley - -	1,664		
Total - -	7,638	Total - -	6,357

1866.

Cowpen Hartley - -	6,716	Brancepeth - -	3,181
Garswood Park - -	124	No. 3 Rhondda Valley -	1,718
Patent Fuel - -	300	Garsfield - -	115
		Marley Hill - -	90
Total - -	7,140	Total - -	5,104

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1867.

East Indian coal.

Coal.	Tons.	Coke.	Tons.
Patent Fuel - -	5,351	No. 3 Rhondda Valley -	4,585
Cowpen Hartley - -	3,397	Brancepeth - - -	3,557
Garswood Park - -	181		
Squborwen Merthyr -	200		
Total - -	9,129	Total - -	8,142

BORNEO.

Borneo.

The Coalfields of Labuan.—The island of Labuan is described by Mr. Lumsden, of the Oriental Coal Company, as being built up of a great mass of coal measures, incorporated with the new red sandstone, and forming an elevated segment of a large coal basin, the two ends and opposite sides of which extend into the sea. There are seven seams or outcrops, ranging from 1½ feet to 11 feet in thickness. Two seams are 4,000 yards in length, with an aggregate thickness of 15 feet of clear coal, and to these two seams all mining operations have hitherto been confined. They constitute the upper section in the smaller division of the island north of the high sandstone ridge. The lower section in the larger division of the island, south of the ridge, embraces three outcrops, each 4 feet thick, which have never been proved in depth. From the strike of the strata it is inferred that within the compass of the island there must be at least 7,000 yards in length of the three seams. One seam has been traced to within 2,000 yards of Victoria Harbour, and it may come closer. To sum up, the coalfield is of the length and breadth of the island, and there are five workable seams, with an aggregate thickness of 27 feet. Mr. Lumsden estimates the length of this thickness of coal at two miles, which leaves more than the usual allowance for wants, faults, and waste. From 1850 to 1857 the coal raised was 80,642 tons, and the cost of raising was more than 2*l.* per ton, whilst the average net receipts did not exceed 1*l.* per ton. This the Governor attributes to the failure of the coolie immigration. The Government has now sanctioned the introduction of convicts from the Straits Settlement, and the pay sheets for June showed a clear balance of profit, the first obtained for 20 years. The coal is reported to be good for steaming purposes, and about 25 per cent. inferior to Welsh. It burns quickly, gives great heat, forms much clinker and soot, and leaves little ash. Capt. Reid considers it to be equal or superior to many descriptions of coal sent into the markets, where it will obtain a good character if the people at the mines faithfully supply it in good and proper order. The engineers of H.M.S. Dwarf think the only objection to Labuan coal is that it is 15 per cent. lighter than the average of Welsh coal, mixed with which would make it fit for the service. Reports from 30 of H.M.'s ships, coming down to 1865, vary in the opinions expressed; some declare the coal fit, and others unfit, for the services; and favourable reports differ slightly as to the best proportions with which Welsh and Labuan may be mixed.

"Coal is found on the Sadong, on the Batang Lupar, and on the Lingga, a branch of the Batang Lupar. It has also a few days ago been discovered at Muka. Its quality would appear to be of a new formation, and something similar to that now worked at Labuan."*

In a despatch from Governor Pope Hennessy to his Grace the Duke of Buckingham and Chandos, dated November 18, 1868, we have the following account of the Labuan coal:—

"The coalfield is of the length and breadth of the island, in two sections, the upper section containing two workable seams, and the lower section three workable seams of coal, being five seams of an aggregate thickness of 27 feet. Mr. Lumsden thinks it quite safe to estimate the length of this thickness of coal at two miles, which leaves more than the usual allowance for wants, faults, and waste. Taking a workable depth at from 100 fathoms to 150 fathoms vertically, this gives on the slope or inclination of the measures a breadth of at least 600 yards. These dimensions represent a mass of coal 20,000,000 tons in weight, which is equal to an output of 100,000 tons of coal a year for 200 years. Mr. Lumsden states that there is a supply in the upper section alone for 50 years, at the rate of 200,000 tons a year."

The following figures exhibit an approximate statement of the amount of coal raised at the Labuan collieries, and a statement of the local expenses since the first company was formed.

EASTER ARCHIPELAGO COMPANY.

Years.	Coal raised.	Salaries and Expenses.
	Tons.	£ s. d.
1850	1,167	1,845 16 6
1851	797	2,954 10 10
1852	4,480	4,833 7 7
1853	6,569	10,960 7 2
1854	9,427	19,414 5 1
1855	5,208	12,946 13 2
1856	3,527	13,642 0 0
1857	313	5,022 0 0
Total -	31,488	71,619 0 0

* Report of Mr. Consul Pricketts on the commerce of Sarawak for the year 1863.

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Borneo coal.

LABUAN COAL COMPANY, LIMITED.

Years.	Coal raised.	Salaries and Expenses.
	Tons.	£ s. d.
1860	—	1,418 7 3
1861	40	8,905 12 5
1862	3,255	7,486 1 2
1863	10,882	12,157 15 6
1864	15,889	16,736 13 2
1865	6,270	9,882 8 6
1866	7,971	19,555 14 7
1867	7,074	10,800 7 2
Total -	51,981	86,942 19 9

In 1868 the Governor of Labuan made a report, giving some favourable notices of the quality of the coal.

We have not been able to obtain any reliable returns of the quantity of coal raised during the last three years, but the following statement shows that considerable activity now prevails in the works of Labuan:—

"The Oriental Coal Company (Limited), into whose hands the extensive coal mines in the island of Labuan have passed, are now (1869) working them successfully. In anticipation of a great increase in the demand for coal in the China seas on the opening of the Suez Canal, it has been decided to supply coal at the fine harbour of Victoria, which admits and shelters vessels of the largest size at all times of the tides and at all seasons, instead of at Coal Point, as at present, where steamers can take in coal only in comparatively fine weather. The distance from the mines to Victoria harbour, where the Governor's residence and all the public buildings are situate, is about nine miles, and the coal is to be transported by means of the patent road steamers, with india-rubber tires, of Mr. R. W. Thompson, C.E., of Edinburgh. Two of these powerful engines and 16 waggons, to carry six tons each, are already completed, and will be shipped direct to Labuan in the company's new screw collier the William Miller. These road steamers appear to be exciting great interest all over the world. The Government of India have just ordered to be despatched overland the first engine for a regular service which they intend establishing on the Grand Trunk Road, for the transport of troops, Government stores, and general merchandise, in lieu of the miserably slow and costly bullock trains which now creep along that fine road. The road steamers will, it is said, run five or six miles per hour at far less cost than the bullock hackeries, which cannot keep up a third of that speed."

In the Mining Record Office are "Remarks on the Coal of Labuan and Borneo," by D. M. Gordon, Lieutenant-Commanding H.M.S. Royalist, in 1847; also an account of trials made of this coal by T. Wallage, commander of the honourable company's steamer "Nemesis," of the same date. These are in manuscript; the coal is favourably spoken of.

In 1870 Mr. J. Pope Hennessey reports to the Earl Granville to the effect that the opening of the Suez Canal has already stimulated the demand for Labuan coal. Formerly the sailing ships coming around the Cape brought out vast quantities of coal as ballast; but it is now surmised that this source of supply will diminish, and at a time when steam communication with the last is increasing. The production of cheap coal, of good quality, in Labuan, is therefore a subject of some interest to Her Majesty's navy, and to British commerce in the China Sea. Since Mr. Lumsden, the manager of the colliery, estimated the quantity of coal in a limited area of Labuan at twenty millions of tons, he has had an opportunity of examining a seam of coal which crops out near the head of Victoria harbour, and, basing his calculations on data similar to those adopted by Mr. Oldham, director of the Geological Survey of India, he estimates that the workable coal in the whole of Labuan is over four hundred millions of tons.

JAPAN.

The following are the only available notes on the coalfields of Japan:—

IWANAI.

TOMAZI. A bed of coal from four to six feet in thickness, consisting of very good *bituminous coal*, in places very pure, in others intermixed with slate, which is easily separated from it. The coal mines lie two miles inland from a village called KAIANOMA, some seven miles across the bay. Four seams of coal have been discovered,—

2 are from 4 feet to 6 feet thick.
1 is about 1 foot thick.
1 not yet examined.

Seventy-nine pounds of coal burnt in the galley fire of Her Majesty's ship "Salamis," under the superintendence of the chief engineer, yielded 17·27 per cent. of ash, 1·5 per cent. of clinker, an average volume of smoke, and a strong durable flame. *Mr. Erasmus Gower, an English civil engineer*, is making arrangements to work this coal. He expected the mine to be in working order by the end of June 1868. According to him, the probable cost of the coal delivered would be *four dollars the ton on the spot*; freight to HAKODATE would be three dollars the ton, and to YOKOHAMA or NAGASAKI six dollars the ton.

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Coalfield near the Port of Hiogo.

Sir Harry S. Parkes communicates (1867) to the Foreign Office some particulars of "another coal- Japan.
field in the immediate vicinity of the port of Hiogo," from Mr. Frederick W. Sutton, Chief Engineer of H.M.S. "Serpent."

The coal is of tertiary formation, and it crops out in a number of places on the sides of a low range of hills, about six miles to the westward of Hiogo. These beds have been occasionally worked by the natives. Between 1857 and 1861 they sent into the Hiogo market 500 tons. In February 1867, 30 men were employed, and up to May they had obtained more than 170 tons of coal. Mr. Sutton says, "the best coal brought out in my presence was quite equal to *Takosima* (Nagasaki) coal. It is not of exactly the same description, but more of an anthracite kind."

There is no evidence of the value of this coal, and evidently the statement of the coal being of tertiary age and of "anthracite kind" wants consistency.

At a meeting of the Geological Society of London, April 14, 1869, a paper was read "on the coal mines at Kaianoma, in the island of Yezo." By F. O. Adams, Esq., Hon. Secretary of Legation in Japan. Communicated by the Secretary of State for Foreign Affairs.

The writer states that the works at Kaianoma have made considerable progress since they were reported upon by Mr. Mitford last year. There are four seams of coal, each about seven feet thick, from 50 to 100 feet apart. A tunnel has been driven through one of the seams for a distance of between 150 and 250 feet, and at an elevation of 430 feet above the sea. From this the coal obtained is carried down to the shore on the backs of men, mules, and ponies. The writer adds that there is abundance of coal "of the cannel description."

At the end of 1870, according to the *Nagasaki Gazette*, the coal from Takasima, which has long been known to be a good coal, was ordered to be used by all steamers in the Japanese waters. The export of coal from Nagasaki has diminished of late, but this is referable to the want of ships to take it away. 1,174 tons have been shipped, and several vessels were engaged in taking coal for China.

The Netherlands Trading Company are using the utmost energy in their efforts to develope this coal. They have recently sent out a young English Mining Engineer, Mr. Frederick Potter, to take the entire management of those mines. A large quantity of machinery, tools, &c. have been ordered from England, and a large steamer has been purchased for the entire use of the collieries.

We may therefore expect that in a little time they will be producing 500 ton of coal a week. The letter given below describes the present condition of those mines.*

CHINA.

There appears to be much good coal in China, but the accounts of the coalfields and their produce Chinese coal-
are very contradictory. Coal is procured in apparently large quantities from a mine on the river fields.
Yang-tse-kiang, about 400 miles from its mouth.

Consul Braune, in his report to Sir F. Bruce, says, writing from Tamsuy, January 21, 1864, "It is "to the coal mines of Kelung that we must look to the future prosperity of this place as a port of "trade; a depôt has been already established there by a large firm to supply their own steamer, "running on the coast."

In 1863 there were exported from the port of Tamsuy, in British vessels, 10,801 piculs of 133 lbs. avoirdupois; in foreign vessels, 1,259,152 cotties of 1⅓ lbs. avoirdupois; also from the port of Tien-tsin, 180 tons, value 1,800 taels, of 6*s.* 4½*d.* each.

Mr. Consul Mongan's report for 1864 on the trade of Tien-tsin, says, I allude to coal, extensive "mines of which exist in the mountains to the north and west of Peking. It costs about 16*s.* per ton "at the pit's mouth, and more than double this amount per ton is paid for transport to the coast; but "the mines are worked in the rudest way, and the little coal which finds its way from the western "range of Tien-tsin is conveyed on mules or camels from the mountains to Tang-chow on the Peiho, "and thence down the river in boats to this port. From the mines in the northern range there is "water communication of an indifferent kind to Tien-tsin, but the quality of their coal is much inferior "to that which comes from the western mountains."

Coal has been discovered to exist in Pong-hou, the chief island of the Pescadores.—Robert Swinhoe, Consul at Amoy, April 4, 1867.

From a subsequent account (Sept. 2, 1867,) it would appear that this coal is a not very good lignite, which "burnt heavily, and injured the fire-bars of the stoves and hurt the boilers, and that it was not "until he (the Chinese Admiral) succeeded in getting some bags of true coal, which some villagers "had taken from a wreck, and kept in possession, that by mixing the two he was able to raise steam "and venture to sea."

The conclusion of a somewhat rambling story is "by our own researches and inquiries we have settled the point that no coal useful for steam purposes has been yet discovered at the Pescadores."—*Reports received from Her Majesty's Secretaries of Embassy and Legation respecting coal.*

Lesima, Nagasaki, Japan, May 12, 1871.

* There is a great deal to be done here, everything being in very bad order at the old pit.

They are sinking a new pit on the south side of the island. They are now down about 105 feet, and have cut a seam of 3′ coal, 2′ fire-clay, 2′ coal. We expect a 10′ seam, about 20′ below the 7′, and there is said to be an 8′ below that. We are now sinking to the 10′. The measures dip, namely, N.E. (about N. 30 E.), but there are several faults about, which in some places change the dip generally about 10° to 15°.

The old pit (No. 1) is sunk 150′ on the N. side of the island, to the 8′ seam. Our dip workings are at present stopped by a fault which we are cutting through. The Japanese have pretty well cleared out the 8′ seam from the *island*. We are working under the sea about low-water mark.

The 150′ above the 8′ seam is almost entirely sandstone. Below the 8′ we get about 150′ of alternations of shale and thin sandstone, with several small seams to the Gomogosak seam, about 5′ coal, but a good deal worked out; then 100′ sandstone to the 7′ seam in No. 2; but I will give you more particular information by-and-bye.

There are very few fossils, no ferns to be seen, but lots of "*mals*" in the coal.

I am very busy sending instructions to Holland for machinery for the new shaft; and how I shall get the Japanese to build a big chimney puzzles me.

The island is very pretty, with a high sandstone ridge running through the middle of it from E. to W., the stone above the 8′ seam, studded over with fir trees. After being in the tropics, Japan looks like home with its fir trees.

There is no fresh water on the island. The mainland about Nagasaki is clay slate, sometimes very micaceous, and a felspathic rock. The coal measures dip off from the clay slate.

Frede. Antony Potter.

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The following is from the annual address of Sir Roderick Murchison, the President of the Royal Geographical Society for 1871.

"The Baron (Baron Von Richtofen) explored Honan and Shansi, and in the latter province he met with the richest reward of his labours, one of the most remarkable coal and iron regions in the world." The Baron estimates the coalfieldof Shansi to be considerably greater than that of Pennsylvania, and to be capable of supplying the world for thousands of years to come. So in illustration of the thickness and extent of these carboniferous beds, he says, that were a railway ever to be constructed in that region it would be tunnelled for miles through coal beds. These vast resources are not utilised, owing to the unskilfulness of the natives in mining, and chiefly to the absence of roads. There being no available water communication, and the bridle roads being indescribably bad, the coal and iron of Shansi cannot be profitably transported for more than a few miles. The Baron predicts a wonderful improvement in the condition of the people, and the stability of the government, when railways are permitted to connect those great mineral regions with the coast."

MADAGASCAR.

Mr. Consul Pakenham in his Report on the trade of Madagascar for the year 1863, says, "Coal "mines are known to exist, but are little sought after, on account of a very ancient law being in force, "which prohibits persons, on pain of death, from digging up the earth in search of minerals."

NEW SOUTH WALES.

New South Wales.

Running down the rivers Bremer and Brisbane to the town of Brisbane, numerous outcrops of coal may be seen in the banks. Several works are situated about half way between Ipswich and Brisbane. This coal is of much importance to the steam navigation of Moreton Bay. In the parish of Maggil several collieries are established. "The coal varies from five to six feet in thickness, dipping south "forty degrees east, angle from seven to eight degrees, although not worked to its whole thickness, "excepting where they wanted head room for the 'horse way.' The main coal separates from the top "coal at about four feet; the two feet of the top coal is good, but mixed with a small quantity of "earth."—(*Stuchbury*). This Geological surveyor has given in his report several sections of the coal on either side of the Bremer river.

The number of coal mines, their produce and value being,—

In 1861, 18 mines produced 342,068 tons, valued at 218,821*l.*; in 1862, 33 mines produced 476,522 tons, valued at 305,235*l.*; and in 1863, 20 mines produced 433,889 tons, valued at 236,231*l.*

New South Wales exported in 1861, 207,820 tons; in 1862, 308,782 tons; and in 1863, 298,337 tons.

The more recent condition of this important coalfield will be found on a future page.

Mr. T. Lewis, the Examiner of Coalfields, reports to the Legislative Assembly, New South Wales, in 1869, states that sixteen collieries were working in the northern and four in the southern districts, making twenty collieries, and three kerosene shale mines.

Mr. Wm. Keene, Examiner of Coalfields, reports, 28 April 1870,—

"New works are in progress in various directions. New Lambton is an important extension of our colliery workings, and the original Lambton or Scottish Australian Company is engaged in an important and interesting sinking for coal at Stockton, on the north shore, opposite Newcastle * * * Messrs. Vivian and Mitchell are commencing operations at Greta, and farther to the north, in the direction of the line of railway, coal is found near Muswellbrook, at Wingen, Page's River, and Murrundi. In the west researches continue to be made for workable seams near Mount Victoria and Little Hartley * * * A fine seam of coal has been opened at Lithgow Valley near to the Bowenfells railway station * * * In the south, Wollongong maintains its reputation as producing a good steam coal, and near to the Great Southern Railway seams have been proved to be workable at various points, particularly at the Cataract and Sutton Forest. 'I have examined,' says Mr. Keene, 'seams more than seven hundred miles to the north of Newcastle, belonging to the same deposits we are working here, covered and underlaid by the same fossil flora and fauna, and we may without hesitation claim to rank with the most extensive coalfield in the world.'"

The following tabular statement will show that the entire quantity of coal raised in 1869 by the collieries of Newcastle and its vicinity, including Minmi, amounted to 778,263 tons. The northern pits raised 35,892, the southern ones 99,091, and 6,276 tons of oil-coal and shale have been raised in the southern and western districts.

In 1868, the number of coal mines at work were 28; the quantity of coal raised 954,230 tons, of the value of 417,809*l.*

List of Collieries and Kerosene and Shale Mines in New South Wales, with the number of persons employed, and quantity of Mineral raised, in 1869.

No.	Mines.	Proprietors.	Tons of Coal raised.	Tons of Oil-coal and Shale raised.	No. of People employed.	Remarks.
1	Borehole - -	Australia Agricultural Company.	168,108	—	376	
2	Burwood - - -	Trustees of Dr. Mitchell -	2,930	—	12	Worked only about three months.
3	Minmi - - -	J. and A. Brown -	13,523	—	327	
4	New Lambton - -	Ditto - -	109,850			
5	Wallsend - -	Wallsend Coal Company	154,000	—	320	
6	Lambton - - -	Scottish and Australian Mining Company.	153,368	—	257	
7	Waratah - -	Waratah Coal Company -	127,184	—	285	
8	Co-operative Colliery -	Laidley, Ireland, and Company.	44,000	—	180	
9	Dark Creek - -	Wm. Steel - - -	300	—	1	Only supplying sawmill.
10	Sunderland - -	A. Tulip - - -	500	—	3	Local consumption.

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New South Wales.

No.	Mines.	Proprietors.	Tons of Coal raised.	Tons of Oil-coal and Shale raised.	No. of People employed.	Remarks.
11	Notts' Inganee Seam -	Mr. Nott - - -	8,266	—	18	Supplied to steamer at Morpeth.
12	Mitchell's Seam - -	John Michell - -	9,426	—	18	Ditto.
13	Rathluba Pit - -	Mr. Tunks - - -	500	—	2	For Maitland gasworks.
14	Stoney Creek - -	Frank Russell - -	900	—	4	Local consumption, Maitland and environs.
15	Anvil Creek - -	Wm. Farthing - -	14,400	—	30	Good household and steam coal, splinty cannel.
16	Rix's Creek - -	Jas. Elliott - -	1,900	—	6	For supply of Singleton.
17	Bulli, Wollongony -	Bulli Coal Company -	64,000	—	90	
18	Osborne, Wallsend -	Robson and Company -	16,677	—	25	
19	Mount Pleasant - -	The Honourable James Byrnes.	17,014	—	25	
20	America Creek - -	John Graham - -	1,300	—	1	For the oil shale furnace.
21	Sutton Forest - -	M. Larkin and Company	100	—	4	Scarcely in working order.
22	America Creek - -	John Graham - -	—	2,076	10	For kerosene oil.
23	West Kerosene Coal Mine	Western Kerosene Oil Company.	—	3,000	12	Ditto.
24	Hartley Kerosene Coal Mine.	Hartley Kerosene Oil and Petroleum Coal Company.	—	1,200	6	For kerosine oil and supply of gasworks.
			913,246	6,276	2,012	
		Oil-coal and shale -	6,276	—	—	
		Total coal and oil-shale -	919,522	—	2,012	Persons employed.

	Tons.
In 1869 - - - -	919,522
1865 - - - - -	585,525
Increase - -	333,997

The importance of the following Reports on the coal and collieries of New South Wales, by Mr. W. Keene, the Examiner of Coalfields to the Honorable the Commissioners of New South Wales, for the International Exhibition of 1862, is such that its insertion here requires no excuse.

Having been honoured by you with copy of communication from the Lords of the Admiralty, stating that their Lordships had granted permission for the institution of a series of experiments in Her Majesty's Dockyards, with a view of testing the relative heating powers of the different varieties of the Australian mineral as compared with each other as well as with British coal:

And further informed of the wish of their Lordships that to secure this important object, and to render the results as little liable to error as possible, no specimen would be forwarded less than two tons, I addressed a circular to the proprietors of the principal collieries in work, and they readily accepted their Lordships' offer. Two tons or more of fair round hand-picked coal has been supplied, properly packed by each colliery, under my inspection, and shipped with the other exhibits for London.

The Australian Agricultural Company send two tons from their mine known as the Bore-hole Colliery. The seam is 163 feet from the surface, and 150 feet below the sea level; its greatest thickness about 9 feet, with average dip to the south-east of 1 in 20. This coal is greatly esteemed in the Melbourne and Californian markets. Ships of large tonnage can load at the staiths of the company, to which the coal is taken from the pit's mouth by locomotives, a distance of about two miles.

The same company send also two tons from their F pit, situated on the hill side at Newcastle, and in which, at 90 feet below the surface, the coal known as the Yard seam, and visible on the coast at the sea level, is worked. For many years this was the only coal wrought by the Australian Agricultural Company. It is rather soft in quality, but esteemed for household purposes, gas manufacture, and blacksmith's work. These coals are also taken to the wharf by locomotives. The company frequently ships 500 tons a day, and can readily supply larger demands. Price 14*s.* 6*d.* per ton.

The Newcastle Coal and Copper Company send two tons from their colliery, working what is known as the Burwood seam. This coal is seen in natural section on the cliffs of the sea coast, 60 feet above the sea level, and has been worked into by day-levels in the Burwood range of hills near Newcastle. The two tons sent are from a new drift just opened in the hill known as Little Red-Head, and the coal is the same seam as that of the Burwood range. Between the two workings there appears a down-throw *fault* of more than 60 feet. The sample is taken from the top and middle of the seam.

Section of the Seam.

	Feet.	Inches.
Top coal - - - -	2	6
Fire clay parting - - - - -	0	3
Middle coal - - - -	2	3
Clay band - - - - -	0	2
Bottom coal - - - -	3	6

This coal is easily worked, and carried by locomotives to the shipping wharves of Newcastle, at the rate of 500 tons per day. Price 13*s.* 6*d.* per ton.

The Wallsend Company send two tons from what is known as the Wallsend seam. The coal in this pit is 127 feet from the surface, and 80 feet below the sea level; 9 feet 10 inches in thickness, including partings, which divide the seam into three bands. The partings are together about 10 inches

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New South Wales.

in thickness. The two tons sent are an average mixture from top, middle, and bottom portions of the seam. The Wallsend workings are situate about half-way between Minmi and Newcastle, the strata rising towards the north-west ranges. The works connect with Newcastle by a branch railway to join the Great Northern line at Waratah, about four miles from the port, and the locomotives take coal to the ship's side at the wharf at rate of 500 tons or more daily. Price 14*s.* 6*d.* per ton.

This colliery has not been long opened, and the coal finds favour in the markets of Melbourne and California.

The Minmi Colliery Company send two tons from their C pit. The seam is 90 feet from the surface, and 20 feet above the sea level. An outcrop of the seam is visible in a creek about 400 yards from the shaft, rising in a northerly direction 1 in 18. It appears to be the second seam below the chert rock which covers the Coal and Copper Company's seam at Burwood, and is bedded on a hard sandstone grit of good building stone. The coal is much liked by the blacksmiths of the district, and the small makes a good coke, as does the small coal of the collieries of the Newcastle district generally. Messrs. J. and A. Brown, the owners of these mines, raise about 300 tons a day, which is shipped at Hexham, a township on the banks of the Hunter River, 10 miles from Newcastle; or the coal is sent down in barges laden with boxes, which are hoisted by a steam crane so as to load ships of any tonnage whilst at anchor in the stream. The seam averages six feet of clean coal, such as the two tons sent.

The Tomago Company have put down a shaft 365 feet to the coal, the deepest as yet in New South Wales. They first struck a seam six feet thick at a depth of 342 feet, but finding a thinner seam of better quality twenty-three feet lower, they preferred to work this "Longwall," and they supply from 100 to 150 tons daily of what is esteemed a good furnace coal. The pit is on a level at a distance of only 700 yards from the river bank, where vessels of 200 tons can take in their load. The company has been lately re-organised, and is preparing for operations on a more extended scale. This coal is highly bituminous, and remarkable, in common with the Bore-hole and Minmi seams, for its tendency to reniform and orbicular fracture; a peculiarity which appears to belong to the middle seams of the series, the upper and lower seams being more disposed to splinty cleavage, and burning to ash with little cinder.

The Four-Mile Creek Company, Messrs. Christian, Nixon, and Co., carries on its operations in the East Maitland district, near to the head of the navigation of the Hunter River, 15 miles from Newcastle. There are at least three seams recognisable in this district, and that worked is 8 feet 6 inches in thickness, 5 feet 6 inches of which is a splint coal of very superior quality, chiefly used by the two lines of steamers navigating daily between Morpeth and Sydney.

The admirable regularity with which these ocean steamers perform their service, their engines of 160 horse-power easily kept to the top of their speed with steam to spare, and blowing at the valve, give sufficient and constant evidence of the excellence of the coal; in fact, I have long considered, and often expressed the opinion, that good, clean, hand-picked New South Wales coal is at least equal, if not preferable, to the best coals of England, when these latter have been twice transhipped; that is to say, in the state in which English coal can alone be got in Sydney, and at double the price of the best produce of our own mines.

The Four-Mile Creek is a hard splint coal, does not clinker, and burns to a fine dry ash; is very comparable to the coals shipped from Goole, in Yorkshire; whilst our bituminous coals may be likened in quality to the "Hartley."

Descending the strata, and below all the seams of these collieries, at West Maitland, about five miles north from Four-Mile Creek, two seams of cannel and splinty coal are worked, the property of the Hon. Bourne Russell, specimens of which may be seen in compartment No. 22, of the Geological Collection in the Exhibition.

As this cannel coal is most useful, and is chiefly employed for domestic purposes, the proprietor has considered it needless to send it to be tested as steam coal.

Thirty miles farther to the northward, at Rix's Creek, near Singleton, a seam of good coal is worked, of which a sample will be found in compartment No. 15, and this concludes the collection from the northern district.

Sixty miles south from Sydney are the Ports of Bellami and Wollongong; and though they cannot be compared for accommodation with the Port of Newcastle, the energy of the coal owners of the district, and the facility with which coals can be worked by "day levels" from a seven-feet seam, which shows itself in section along many miles of the mountain range, assure to this field a progressive development to prove the inexhaustible resources of New South Wales in mineral fuel; and will be a guarantee to commercial interests that no combination or monopoly can long disturb the regularity of the supply.

At Bellambi, vessels load from a jetty the coals brought down the mountain side along a tramway to the ship, and from 100 to 200 tons are thus sent away daily.

At Wollongong there is a like arrangement for the Mount Keira Mine, and like quantities are shipped from that port. Each of these collieries send two tons of coal to be tested.

There is a day level worked by a mining party between Mr. Hale's Bellambi Mine and Mount Keira. A drift is also making into the seam four miles south of Dapto, and more than 20 miles south from Mr. Hale's, whilst five miles north from Mr. Hale's a tramway is in course of construction to Bellambi, for a company about to be incorporated by Act of the New South Wales Parliament, and named the Bulli and Bellambi Coal Mining Company. Coals would have been sent from this latter had there not been some impediment to their carriage to the ship just at this time, from the preparations for the railway works.

I have examined all these new drifts, both at the extreme north and south points at which the seam has hitherto been opened, at heights varying from 500 to 600 feet above the level of the sea, at a distance of at least 25 miles from each other, and can say that the coals appear equally good with those from the drifts in work—all upon the same seam, and showing a great regularity of thickness of about seven feet.

Besides this, and 15 miles nearer to Sydney, at Coal Cliff, I found a seam at the level of low water, six feet in thickness, very like to the splint coal of Four-Mile Creek, and this seam will probably, from its apparent good quality, soon be worked.

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New South Wales.

On approaching Sydney from the Coal Cliff there is a sudden fall in the strata, showing a down-throw of more than a thousand feet, so that there would be little chance of meeting with coal at Sydney without going through the whole series of sandstones which cover the coal measures, and which we know from exposed sections to be about a thousand feet in thickness.

Inland, and to the west from Wollongong, these same seams rise "to day" 2,000 feet above the level of the sea at the Fitz Roy Iron Mines, at Black Bob's Creek, and near to the Hanging Rock on the Southern Road. At this last place I laid bare a seven feet seam of coal only a few weeks ago, and it is from here that Goulburn, one of our largest inland towns, where wood for fuel is already a very costly item in steam power, will get supplied. The finest magnetic ore (see compartment No. 37,) and limestone, abound in close proximity to each other in the vicinity of Goulburn, and the completion of the railway, which will pass close to the Hanging Rock, at 25 miles from Goulburn, will bring together these valuable raw materials, coal, iron, and limestone.

I have to acknowledge the ready compliance of the varous companies and coal owners with the request made by me on behalf of the Lords of the Admiralty, and testify that the coals sent are from the different collieries indicated.

Since the year 1856 the trade of the old companies has nearly doubled, whilst new companies have started into existence, and the extraction and sales of these latter are now equal to what the old companies were doing five years ago.

By reference to the collection I exhibit, it will be seen that I can recognise eleven distinct seams which are more or less worked. The same series of seams extends from Newcastle to the Wollongong district, disturbed and broken up only by comparatively modern eruptions of porphyries and basalts.

On the lands of the Australian Agricultural Company, a few miles from Stroud, a seam more than 30 feet in thickness crops out in the length of a creek, and this thickness has been verified by several trial pits sunk on the dip side. There are many partings of shale and fire-clay, and the coal is of various quality in the thickness of the seam, but there is quite sufficient of good coal for profitable working, if its inland position did not render it wholly unavailable in face of coal so easily accessible from the sea-board as that of Newcastle and Wollongong.

As regards the geological age of the coal of New South Wales it would be easy to add pages on this subject, if I did not think it irrelevant to the question with which I am now occupied, except so far as the geological age of a coal is inseparably connected with its commercial value. That is to say; though there may be and there is much bad coal in the palæozoic or true carboniferous series, a really good coal in the Oolitic, Lias, or Tertiary deposits is a thing unknown. To class the mineral fuel of New South Wales as belonging to either of these latter formations would be at once to discredit and condemn it in the market of the world, until, despite discredit and condemnation, its merits were discovered; when it would be tardily acknowledged that the condemnation had proceeded from an error in science, arising out of deficient or too superficial an investigation, or the two facile application of inapplicable therories.

A reference to the collection I exhibit will settle this long disputed question, and for the reasons stated I may be permitted a few words more on the subject. All the seams of the New South Wales coalfield, from the lowest which intercalate with Silurian fossils (Spirifer, Radiata, &c.), Devonian Flora (Lepidodendron, Cyclopteris, Adiantites), and the Bellerophon and Crinoidea of the mountain limestone, to the highest and latest deposited seams, in which the Flora (Equisetacæa, Asterophyllites, &c.,) approach the Oolitic character, all are deposited conformably and almost in parallelism, one on the other; covered also conformably by a thousand feet of sandstone, upon which again has been quietly deposited the Wyanamatta beds, which I have called the false coal measures, for with all the appearances of being coal bearing, they contain no coal, but a flora probably nearer approaching to that of the Oolite.

The lower beds of the coal series of New South Wales are, then, geologically older than any worked in Europe; whilst the upper beds represent the most recent of the European true carboniferous formation. And as all the coal seams, from the Silurian upwards, are deposited conformably, I must conclude that this portion of the globe was comparatively free from violent eruptions and disturbances from the Silurian to the Permian epoch, and that the alternate submergencies and elevations of the land must have been slow and gradual.

In stating my opinion here as to the age of the carboniferous deposits of New South Wales, I am in part repeating only what I reported after my first examination in this field in 1853. I then wrote: "The coal is a true coal, not lignite, or a deposit of the tertiary epoch, but belongs to the true coal "formation; is overlaid by regular beds of secondary sandstone, lying in conformable strata upon it."

Seven years ago, I wrote and reported: "The geology of our coalfield commences with the sandstone, and I believe this sandstone to correspond with the lower beds of the Permian system." It is a satisfaction to me to learn that this opinion is borne out by researches carried on under the direction of the Rev. W. B. Clarke, and I shall avail myself of the earliest opportunity of pursuing this examination in the field, where the interesting specimens exhibited by Mr. Clarke have been found.

W. KEENE,
Government Examiner of Coalfields.

The progress of the Australian coal industries will be shown by the following table, extracted from the Statistical Register of New South Wales.

"1860.—Coal raised in New South Wales, 60 miles north of Sydney.

	Tons.
Australian Agricultural Company (three mines)	134,943
Coal and Copper Company (two mines)	112,434
Minmi (one mine)	44,020
Tomago (one mine)	16,126
Maitland four mines)	28,560
	336,083

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New South Wales.

Forty miles south of Sydney.

Mount Keira (Wollongong)	19,200	
Bellambi (ditto)	13,129	
		32,629
		368,712
Berrima (on southern road, 80 miles inland) } Hartley (on western road, 70 miles inland) }		150
		368,862

"In 1861 several new mines were being worked, and one company, the Wailsend, with a large capital and all modern appliances, commenced operations. The old companies have also raised increased quantities of coal.

"Export of Coal from New South Wales, 1860.

	Tons.
To Victoria	98,068
To South Australia	17,620
To New Zealand	14,881
To Tasmania	9,614
To other British colonies	36,582
To New Caledonia	1,002
To the South Sea Islands	240
To the United States of America (California)	3,820
To other foreign States	52,050
	233,877."

In 1865 the results were as follows:—

		Tons.	cwt.	qrs.
Berrima	Fitz Roy (Nattai)	7,500	0	0
Hartley	Cooerwell	365	0	0
Cambelltown	Stanwell Park	—		
Newcastle	Wallsend	154,875	0	0
	Minmi	335	0	0
	New South Wales Co-operative Colliery, Wallsend	2,507	3	0
	Burwood Colliery	9,500	0	0
	Lambton Coal Company	112,940	0	0
	Waratah Coal Company	85,400	0	0
	Australian Agricultural Company (Borehole)	112,027	0	0
Maitland	Alnwick (West Maitland)	200	0	0
	Woodford (Ditto)	3	0	0
	Rath Lubie (Ditto)	773	0	0
	Stony Creek (Ditto)	1,805	0	0
	Anvil Creek (Branxton)	12,000	0	0
Gosford	Murray's Pitt (Morrissets' Point)	—		
Patrick's Plains	Rix's Creek	468	0	0
Woilongong	Mount Pleasant	18,022	0	0
	Osborne, Wallsend	18,022	0	0
	Bellambi	18,866	10	0
	Bulli	29,867	0	0
	American Creek	50	0	0
	Total	585,525	13	0

1865	585,525
1860	368,862
Tons, 216,663 increase.	

Export in 1865.

	Tons.
Great Britain	3½
Victoria	130,500
Queensland	4,936
New Zealand	87,736
Tasmania	10,756
South Australia	58,433
South Sea Islands	6,906
New Caledonia	1,099
Foo-Chow-Foo	1,199
Valparaiso	3,317
Hong Kong	6,766
Petropaulowski	3,266
United States	22,686
Point de Galle	2,020
Bourbon	1,470
Mauritius	2,361
Western Australia	303
Manila	2,171
Calcutta	3,244
Shanghai	28,662
Madras	410
Japan	550
Ceylon	1,300
Cape of Good Hope	172
Batavia	2,702
Total	382,698½

1865	382,698
1860	233,877
148,821 increase.	

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Export of Coal from New South Wales in the year 1866, 1867, and 1868. New South Wales.

——	1866.	1867.	1868.
	Tons.	Tons.	Tons.
Victoria - - -	143,746	145,833	165,715
New Zealand - -	95,446	79,576	92,605
Queensland - - -	10,406	2,384	3,970
Tasmania - - -	13,203	10,919	2,074
South Australia - -	81,079	73,289	64,632
Singapore - - -	11,604	25,885	26,027
Hong Kong - - -	15,512	9,807	7,990
Shanghai - - -	63,593	54,774	92,958
Petropaulovski - - -	11,984	—	—
United States - -	48,242	22,118	33,205
Java - - - -	11,999	—	—
Valparaiso - - -	8,044	—	—
Batavia - - -	—	15,400	17,806
Mauritius - - -	—	5,116	5,545
Other Places - - -	26,047	28,256	35,509
Total - -	540,905	473,357	548,036

As regards the capability of the colony to furnish coal, Mr. Keene states that—

"The present appliances of the collieries in work are equal to the production and shipment of 20,000 tons weekly, and this quantity can be readily increased so as to keep pace with any extent of demand. The average price for good screened coal is 14*s.* per ton at the shipping waiths. Locomotive engines draw the coals along tramways from the collieries to the shipping wharfs, where steam cranes and other facilities are in action for the ready loading of vessels of large tonnage."

The wharf at Newcastle is one-third of a mile in length,* and the river there is often crowded with vessels of all sizes up to 1,200 tons, loading coal to all parts of the southern hemisphere.

Vessels going from the colonies to India, China, and the West Coast of America, are now constantly loading with coal at Newcastle, which they take at low freight, instead of paying for stone ballast.

The Illawarra coal seams are about 40 miles south of Sydney, and the seams now in process of being worked are situate some distance up the sides of the mountains. The mines readily drain themselves, while the trucks, in running out of the mines, are kept from getting too much way upon them by a horse fixed behind. The full trucks, in descending the side of the mountains, are used to draw up the empty ones. The coal is shipped at present from Wollongong and Bellambi in small vessels, but large sums have been appropriated by Government to improve both the harbours, and the works are making fast progress.

Queensland in 1863 exported 4,228 tons. The produce of the collieries being in 1861, 14,212 tons; in 1862, 24,067 tons; and in 1863, 2,400 tons.

From these sources the other Australian colonies received as follows:—

In 1863, Victoria received from the other Australian possessions 110,521 tons.

In 1863, South Australia received from New South Wales, 35,187 tons. Other Australian possessions 77 tons.

In 1863, Tasmania received from New South Wales, 6,368 tons of coal; Victoria, 175 tons of coal; New Zealand, 40 tons.

New Zealand received, principally from New South Wales, 61,192 tons.

Colony of Port Phillip.

It has long been known that coal exists along the coast between Western Port and Cape Siptrap in the colony of Port Phillip, but owing to ill devised and directed operations it has never been successfully worked. The coal measures commence with a well-defined boundary, quarter of a mile north-west of Griffiths Point, and are immediately contiguous to the lavas, and protrude into a mass of eruptive rock. Here there were some works carried on under the authority of Mr. Cole, but, as might have been expected, no extended bed was found.

The cliff from Griffiths Point towards Bass's Straits presents a continuous section of the coal measures for eight or ten miles; it is then succeeded by sandy hummocks, but reappears six miles further on at Cape Patterson. Within half a mile of the cape three seams crop out upon the beach. Their exact thickness and dip has not been ascertained, but the following may be taken as an approximation to the truth:

	Thickness.	Dip.
1st or west seam of coal - -	1 ft. 8 in.	25° West
2nd or middle seam - - - -	3 ft. 4 in.	20° „
3rd or east seam - - -	1 ft. 8 in.	20° East

The measures continue to appear at intervals all along the coast to the River Tarwin, a distance of about thirty miles from Griffiths Point.

The quality of the coal at Cape Patterson (the most southerly point of the measures) varies; the thickest or middle seam is of first-rate excellence, well fitted for the forge and for domestic use, and abounding with gas for lighting. It is also very readily worked. The west seam is of an inferior kind,

* 1866, increased to about three quarters of a mile.

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New South Wales.

and carries embedded in it a thin band of shale. The coal measures extend inland to an unknown distance. The coal now sold at the wharf at Melbourne is carried eight hundred miles, and the price 30*s.* a ton.

Melbourne would consume for steam engines, forges, &c., 20,800 tons annually, and if coal could be used for domestic purposes, in the place of wood, taking three loads of wood as equivalent to one ton of coal, the consumption for domestic purposes would be 14,000 tons annually.

New Zealand.

New Zealand.

The hydrous coal measures (lignite) lie on the eastern slopes of the axial rocks in both of the islands of New Zealand. This coal is of a brown colour, but hard and glossy, and frequently contains a quantity of fossil resin, which greatly facilitates its combustion. It is in the locality a valuable fuel, and is largely used both for domestic purposes and for raising steam. It is also applied to the manufacture of bricks and pottery, and for other economic purposes. The best known deposits of this coal in the North Island are those mined at Drury, twenty miles to the south of the city of Auckland. Seams of this coal, varying from 6 to 15 feet in thickness, occur at intervals over a large area of country. In the south island the total quantity of this coal has been estimated at 100,000,000 tons. Two mines have been opened on this field. The Clutha mine is on the sea coast, about three miles from the mouth of Clutha River. The other mine is in the vicinity of Tokomairo. The seam is 9 feet thick, and worked by a level in the side of a hill.

In 1864 the quantity of coal produced from the mines in this district was about 4,000 tons.

Anhydrous Coal.—The most important development of the coal seams of this class is on the west coast of the south island. At Preservation Inlet, in the province of Otago, and at various points on the coast, the same formation occurs, but without any valuable seams of coal, as far as we yet know, until the Grey River is reached.

At Grey River the coal extends over an area which Dr. Haast has estimated at 15 miles in length by 6 in width. "At present (1866) the output of the coal is from 250 to 300 tons per week, and is "taken down the river in canoes and in 16-ton barges, and delivered alongside the vessels at 40*s.* per "ton. It has been used to a large extent on board the steam vessels that frequent the coast, and "gives great satisfaction. A small quantity of this coal is also reported to have been tried in the "Dunedin gasworks, and to have yielded a large quantity of illuminating gas."

In the immediate neighbourhood of the Buller River the existence of workable coal seams is considered certain over an area of at least 15 square miles. Reckoning none of the seams having a less thickness than five feet, there is a total of 38 feet of pure coal, and the quantity available in this one locality has been estimated at 200,000,000 tons.

The following summary of the important features of the anhydrous coal is given in the report by Mr. Stafford to Lord Carnarvon:

Locality.	Quality of Coal.	Thickness of Seam.	Worked by
1. Grey River	Superior	25 feet	Level free.
2. Buller River	Do.	38 ,,	Do.
3. West Wanganui	Medium	8 ,,	Uncertain.
4. Pakawau	Do.	Uncertain	Do.
5. Aorere	Superior	Do.	Level free.
6. Batten River	Medium	Do.	Do.
7. Wangapeka	Do.	Do.	Do.
8. Wangarei	Inferior	6 feet	Do.
9. Kawa-kawa	Superior	13 ,,	Shaft.

In 1869.

The advices received from the Kawa-kawa coal mines in the province of Auckland, New Zealand, were of an encouraging character. The manager had, at the date of the last intelligence, driven to a depth of 225 feet, and had come upon coal of a superior dsscription.

The seam of coal upon which the men were engaged was 15 feet in thickness, and its appearance resembled the finest quality of Newcastle coal. The price charged for gas at Dunedin (New Zealand) has been "reduced" to 20*s.* per 1,000 cubic feet. It is clear, then, that the more coal can be found in New Zealand the better for gas consumers. Coal of good quality has been discovered at Otipiri, in the province of Southland, New Zealand, and the extent of the bed is believed to be almost without limit. Mr. Dawson, C.E., is of opinion that when boring is resorted to a bed much superior to that at present tried will be found at a greater depth.

Coal oil shales have been worked to a considerable extent.

NORTH AMERICA.

North America.

There are in North America four principal coal areas. These are the great central coalfields of the Alleghanies; the coalfields of Illinois and the basin of the Ohio; that of the basin of the Missouri; and those of Nova Scotia, New Brunswick, and Cape Breton. Besides, there are many smaller coal areas which in other countries might well take rank as of vast national importance, and which even in North America may one day contribute greatly to the riches of various states.

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The specific AREAS of the AMERICAN COALFIELDS.* North America.

	Square Miles.
Massachusetts and Rhode Island	300
Pennsylvania:—Anthracite, 4,700 / Bituminous, 12,126	13,126
Maryland	500
West Virginia	15,000
East Virginia	225
North Carolina	45
Tennessee	3,700
Georgia	170
Alabama	4,300
Kentucky	13,700
Ohio	12,000
Indiana	7,700
Illinois	44,000
Michigan	13,000
Iowa	24,000
Missouri	21,000
Nebraska	4,000
Kansas	12,000
Arkansas	12,000
Indian Territory	10,000
Texas	3,000
Oregon:—Anthracite, 100 / Bituminous, 500	600
Washington Territory	750
West of the Rocky Mountains	5,000
Total	220,166

In addition to the above, it is supposed that adjacent to the Rocky Mountains there are some 200,000 square miles of lignites, tertiary and other inferior coal.

Another estimate, also given by the Commissioner of General Land Office, arranges the areas within the ancient Appalachian basin as follows:

—	Square Miles.	Length, Miles.	Breadth, Miles.
Alleghany or Eastern Basin	55,000	875	180
Great Middle Basin	50,000	370	200
North Western Basin and Michigan	75,000	550	200
Western or Rocky Mountain Basin	20,000	400	50
Texas or Southern Basin	3,000	—	—
Total	203,000		

To this we must add the area of the British provinces, as properly belonging to the same great formation: British Possessions.

	Square Miles.
Newfoundland	250
Cape Breton, Sidney Coal	200
Picton	350
Cumberland	250
Prince Edward's Island	150
New Brunswick	1,000
Total	2,200

Coal has been found in Louisiana, on the Iberville rivers and on the shores of Lake Bistineau. It is also reported as having been found at Lake Borgne, but this is probably a lignite. In Kentucky, both bituminous and cannel coal are worked in seams about three or four feet thick, the cannel being sometimes associated with the bituminous coal as a portion of the same seam; and there are in addition valuable bands of iron ore (*the argillaceous carbonate*). The coalfield of Kentucky extends over about 9,000 square miles. In Western Virginia there are several coalfields of variable thickness; one nine and a half feet, two others of five, and others of three or four feet. On the whole there seems to be at least 40 feet of coal distributed in 13 seams. In the Ohio district the whole coalfield affords on an average at least six feet of coal. The Maryland district is less extensive, but is remarkable as containing the best and most useful coal, which is worked now to some extent at Frostbury. There appears to be about 30 feet of good coal in four seams, besides many others of less importance. The quality is intermediate between bituminous and anthracite, and is considered well adapted for iron

* Report of the Commissioner of General Land Office for the year 1867. Abridged and printed by order of the senate of the United States.

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North America.

making. Lastly, in Pennsylvania there are generally from two to five workable beds, yielding on an average 10 feet of workable coal, and amongst them is one bed traceable for no less than 450 miles, consisting of bituminous coal, its thickness being from 12 to 14 feet on the south-eastern border, but gradually diminishing to five or six feet. Besides the bituminous coal, there are in Pennsylvania the largest anthracite deposits in the States, occupying as much as 250,000 acres, and divided into three principal districts.

The Illinois coalfield, in the plain of the Mississippi, is only second in importance to the vast area already described. There are four principal divisions traceable, of which the first or Indian district contains several seams of bituminous coal, distributed over an area of nearly 8,000 square miles. It is of excellent quality for many purposes; one kind burning with much light and very freely, approaching cannel coal in some of its properties; other kinds consist of caking or splint coal. In addition to the Indian coalfield there appears to be as much as 48,000 square miles of coal area in other divisions of the Illinois district, although these are less known and not at present much worked. 30,000 are in the state of Illinois, which supplies coal of excellent quality, and with great facility. The coal is generally bituminous.

The third great coal area of the United States is that of the Missouri, which is little known at present, although certainly of great importance.

Taylor states that at least one eighth of the state of Missouri is overlaid by coal measures. 6,000 square miles are assigned to the coalfields of Missouri. Bituminous coal is stated to have been found in the Arkansas Valley, and brown coal and lignite in abundance in the Upper Missouri Valley.

The following table shows the progress of production in America of anthracite from 1840 to 1865 inclusive, from Schuylkill, Lehigh, and Wyoming:—

Year.	Tons.	Increase and Decrease per Year.
		Tons.
1840	864,384	45,982 increase.
1841	950,973	86,589 „
1842	1,108,418	157,445 „
1843	1,263,598	155,180 „
1844	1,630,850	367,252 „
1845	2,013,013	382,163 „
1846	2,344,005	330,992 „
1847	2,882,300	538,595 „
1848	3,089,238	206,938 „
1849	3,217,641	128,403 „
1850	3,321,136	103,495 „
1851	4,329,530	1,008,394 „
1852	4,899,975	570,445 „
1853	5,097,144	197,169 „
1854	5,831,834	734,690 „
1855	6,486,097	654,263 „
1856	6,751,542	265,445 „
1857	6,431,379	320,163 decrease.
1858	6,819,881	388,502 increase.
1859	7,838,439	18,558 „
1860	8,500,550	662,111 „
1861	7,424,530	76,120 decrease.
1862	7,527,356	102,826 increase.
1863	9,427,619	1,900,254 „
1864	9,998,046	570,427 „
1865	9,483,396	509,650 decrease.

In the Pennsylvania coal district, as will be seen by this table, the increase in production has been very uniform. At four periods only has there been any evidences of a diminished production. In the first 10 years, ending 1850, the increased production amounted to 2,456,752 tons. In the 10 years ending 1860 the increase amounted to 5,179,414 tons, and in the last five years given the increase was 982,846 tons; and from the following table we find that in the 10 years ending 1870 the increase has been 7,349,349 tons:—

The progress of the annual consumption of anthracite in the United States was thus stated in the *Science of New York Exhibition*:—

	Tons.
1820	about 330
1825	„ 35,000
1830	„ 176,000
1835	„ 561,000
1840	„ 865,000
1845	„ 2,023,000
1850	„ 3,357,000
1853	„ 5,195,000

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North America.

The development of the anthracite coal trade of Pennsylvania, as it has been recently exhibited by a diagram constructed by Mr. P. W. Sheafer, engineer at Pottsville [This embraces a period of 50 years, and shows the yield of anthracite of the four great subdivisions of the anthracite region]:

Years.	Lehigh.	Schuylkill.	Wyoming.	Lykens, V., &c.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
1820	365	—	—	—	365
1830	41,750	89,934	43,000	—	174,784
1840	275,313	475,091	148,470	15,505	864,384
1850	690,456	1,782,936	827,823	57,684	3,358,899
1860	1,821,674	3,270,516	2,941,817	479,116	8,513,123
1870	3,172,916	3,853,016	7,825,128	998,839	15,849,899

The Schuylkill trade began in 1822 with the exportation of 1,480 tons; the Wyoming, now by far the largest, in 1829, with 7,000 tons; and the Lykens Valley in 1839, with 11,930 tons.

A detailed table of the anthracite coal trade of Pennsylvania since 1820 will be found in the Appendix.

Appendix Foreign (10), p. 222.

The Cumberland coal region in Maryland belongs properly to the great Alleghany coalfield. Its development has been not a little remarkable, as will be seen by the following table. Most of the coal mines in Maryland are in the Frostbury basin.

THE CUMBERLAND COAL TRADE.

Year.	Frostburg Region.		Piedmont Region.		Aggregate.
	Cumberland and Pennsylvania Railroad.	Cumberland Coal and Iron Company's Railroad.	George Creek Railroad.	Hampshire Railroad.	
	Tons.	Tons.	Tons.	Tons.	Tons.
1842	757	951	—	—	1,708
1843	3,661	6,421	—	—	10,082
1844	5,156	9,734	—	—	14,890
1845	13,738	10,915	—	—	24,653
1846	11,240	18,555	—	—	29,795
1847	20,615	32,325	—	—	52,940
1848	36,571	43,000	—	—	79,571
1849	63,676	78,773	—	—	142,449
1850	77,950	119,898	—	—	196,848
1851	122,331	135,348	—	—	257,679
1852	174,891	159,287	—	—	334,178
1853	234,441	225,813	73,725	—	533,979
1854	212,684	265,694	181,303	—	659,681
1855	171,056	198,401	227,245	65,570	662,272
1856	167,381	227,094	269,210	42,765	706,450
1857	135,917	142,573	252,368	51,628	582,486
1858	214,730	153,548	218,318	63,060	649,656
1859	360,054	158,626	257,740	47,934	724,354
1860	302,947	144,100	289,298	52,564	788,909
1861	92,181	55,279	85,554	36,660	269,674
1862	146,951	64,574	69,482	36,627	317,634
1863	291,065	154,610	266,430	36,240	748,345
1864	481,246	132,198	—	44,552	657,996
Total	3,240,239	2,537,717	2,190,673	477,600	8,446,229

Western Virginia contains the largest portion of the Alleghany coalfield. The coals of the great Kanawha region are of the most repute. The workable seams are 13, giving altogether about 50 feet of coal. Some fine seams of cannel coal are amongst them.

The Alleghany coalfield in Kentucky is but little developed, the production of coal being but little above 250,000 tons a year.

The Alleghany coalfield in Tennessee has an area of about 3,700 square miles, its annual produce being about 500,000 tons.

The Alleghany coalfield in Alabama gives not more than 300,000 tons a year.

The Alleghany coalfield in Ohio has a productive coal area of not less than 7,100 square miles. There are five or six productive coal seams, averaging from 20 to 30 feet of coal.

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North America.

In 1864, Messrs. Daddow and Bannan,* give the following as the average produce of the Alleghany coalfield:—

	Tons.
Pennsylvania	5,870,712
Ohio	1,000,000
Maryland	657,996
West Virginia	500,000
Kentucky	250,000
Tennessee	500,000
Alabama	300,000
Total	9,078,708

Produce of the United States of America from the year 1860, see Appendix, Foreign (11) and (12), p. 224.

The Michigan or northern coalfield is located in the centre of the state of Michigan. Its coal seams are few, and far from productive, 100,000 tons a year being its average out-put.

The great central coalfield is estimated at 50,000 square miles. Of these,—

	Square Miles.
Illinois has	40,000
Indiana	7,700
Western Kentucky	3,300

Illinois.—The coal produced has been stated by Wilber to be annually 650,000 tons, but others think the produce to be not less than a million tons.

Rock Island, a northern border of the Illinois coalfield, produces 100,000 tons a year of coal of good quality.

The mines of St. Clair comprise nearly 50 mines, producing about 500,000 tons a year. The adjoining district of Madison and Grundy give 100,000 tons. The mines of Kewanee give about the same quantity.

Indiana.—The amount of workable coal is stated to be 20 feet, and the production 500,000 tons per annum. The area of the coal measures of Indiana, which form a part of the great western or Illinois basin, is about 6,500 square miles, the total thickness of 15 seams of coal occurring in a depth of section of 522 feet is 28¾ feet. The most important seam of these lower are the so-called *block coals,* which are about 4 feet thick, and are the best iron-making coals of the bituminous class in America. They are non-caking splint coals, giving about 55 per cent. of coke and only 1½ per cent. of ash, and are largely used in iron smelting at Brazil, near Indianapolis, and other places in the State.

Western Kentucky produces only about 250,000 tons a year, and the whole production of the great Central coalfield is stated at 1,750,000 tons.

Missouri and Iowa, or the great western coalfield, is a part of the region already mentioned.

The areas are given as follows:—

	Square Miles.
Iowa	24,000
Missouri	21,000
Nebraska	4,000
Kansas	12,000
Arkansas	12,000

Professor Swallow computes that the state of Missouri will give 134,435,000,000 tons of good available coal. The coal at present produced in Missouri and Iowa is about 500,000 tons a year.

The coal of Kansas and Nebraska is at present nearly valueless.

Messrs. Daddow and Bannan give the following as the total production of coal in the United States in 1864:—

BITUMINOUS PRODUCTION.

	Tons.
Alleghany coalfield	9,078,708
Central coalfield	2,250,000
Michigan or Northern field	100,000
Total	11,428,708

TOTAL PRODUCTION.

	Tons.
Anthracite	10,000,000
Semi-bituminous	635,319
Southern bituminous	200,000
Western bituminous	11,428,708
Total	22,264,027

AMERICAN COALFIELDS, 1870.

ANTHRACITE.

	Tons.
Philadelphia and Reading Railroad and its branches carried from the Schuylkill coalfield	4,694,604
(One twentieth of this was shipped to westward consumers, and near 125,000 were used on the lateral roads.)	

* "Coal, Iron, and Oil, or the Practical American Miner," &c., by Samuel Harries Daddow and Benjamin Bannan, Pottsville, 1866.

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North America.

	Tons.
The Lehigh Valley Railroad shipped (Two thirds of this came from the Hazleton, and one fifth from the Beaver Meadow collieries.)	3,660,551
The Delaware, Lackawannack, and Western railways carried north	669,843
Ditto ditto ditto south	1,678,258
The Lehigh Coal and Navigation Company transported by rail and canal (This company obtained from the Wyoming coal region 1,247,889 tons, from the Hazleton collieries 312,324 tons, and from the Manch Chunk collieries 269,036 tons.)	2,143,134
The Delaware and Hudson Canal Company forwarded	2,364,673
The Summit Branch Railway Company shipped	4,490,101
Ditto from Millersberg by canal	77,410
From Shewakin region shipped	489,314
The Lackawannack and Bloomerby Railroad Company carried	275,720
Northern Central	213,615
	20,757,223

BITUMINOUS AND SEMI-BITUMINOUS.

	Tons.
The Reading Railroad carried	487,184
Huntingdon and Brood Top Mountain Railroad	313,922
	801,106
	20,757,223
	21,558,329

Other tables will be found in Appendix, giving the produce of the United States from 1860 to 1865, and an official return of the imports and production from 1821 to 1842.

The following table shows the general character of the coals produced:—

——	Specific Gravity.	Weight of a Cubic Yard in Lbs.
Pennsylvania:—Lykens Valley	1·327	2,240
Lebanon co., Grey Vein	1·379	2,327
Schuylkill co., Lorberry Creek	1·472	2,484
Pottsville, Sharp Mountain	1·412	2,382
„ Peach	1·446	2,440
„ Salem Vein	1·574	2,649
Tamaqua, North Vein	1·600	2,700
Maunch Chunk	1·550	2,615
Nesquehoning	1·558	2,646
Wilkesbarre, best	1·472	2,884
West Mahoney	1·371	2,313
Beaver Meadow	1·600	2,700
Girardville	1·600	2,700
Hazelton	1·550	2,615
Broad Mountain	1·700	2,869
Lackawanna	1·609	2,715
Massachusetts:—Mansfield	1·710	2,882
Rhode Island:—Portsmouth	1·810	3,054
Average in United States		2,601

In considering the question of the coal production its consumption becomes an important element. We have therefore procured the following statement of the American iron manufacture for two important years:—

AMERICAN IRON MANUFACTURE.

PRODUCTION of BLAST FURNACES.

——	1866.	1867.
	Tons.	Tons.
Anthracite Pig Iron	749,367	798,638
Raw Bituminous Coal and Coke iron	268,996	318,647
Charcoal iron	332,580	344,341
Total	1,350,943	1,461,626

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Of 2,000 pounds, this being in *statute tons* of 2,240 pounds,—

	Tons.	cwts.	qrs.	lbs.
In 1866	1,206,199	2	0	16
In 1867	1,305,023	4	1	4

PRODUCTION of FORGES and BLOOMARIES.

	Tons.	Tons.
In 1866	73,555 ;	of this 36,500 were made from the ore.
In 1867	73,073;	of this 35,800 ditto.

The production of the forges and bloomaries of iron made from the ore was therefore in *statute tons*,—

	Tons.	cwts.	qrs.	lbs.
In 1866	32,633	18	2	8
In 1867	31,964	14	2	16

If these quantities be added to the above, the

TOTAL PRODUCTION will be, of PIG IRON :—

	S. Tons.	cwts.	qrs.	lbs.
In 1866	1,238,833	0	2	24
In 1867	1,336,987	18	3	20

The PRODUCTION of the ROLLING MILLS, *Bars* and *Rails*.

In 1866	1,026,089	tons, of 2,000	pounds.
In 1867	1,041,946	,,	,,

The conditions under which iron furnaces are worked in America differ considerably from those obtaining in this country, the same concentration of a great number of furnaces at one point not being marked. This is due to several causes, chief amongst which is the high price of labour, which render the first cost of furnaces so high as to require strong combinations of capitalists for the construction of works of more than a moderate size. Thus at Brazil in Indianapolis a single furnace, said to be "one of the largest and best conducted in the west," and of about the same size as those originally erected at Barrow, cost 30,000*l.* in construction, exclusive of land, railways, and other working accessories, and produces only 28 tons daily, although smelting ores of 62 per cent. produce, which are brought from Missouri on the south-west and Lake Superior on the north, the distances being from two to four hundred miles.

Considerable difficulty is experienced in the production of good steel-making pig iron, the hematite and magnetic ores suited for the purpose, by reason of the absence of phosphorus, being, as a rule, so siliceous as to yield in the blast furnace an iron too highly charged with silicon to be advantageously used in the Bessemer converts. This point has become one of such importance that it has actually been contemplated to import the Belfast aluminous ore into America for the purpose of fluxing such ores. There appears to be a growing belief among American ironmasters that the iron-making great seat of the country will ultimately be in Kentucky and Tennessee, where the so-called dye-stone ore, a red pisolitic hematite resembling those of Belgium, and approximating in character to the soft red ores of the Furness district, although not so pure as regards the proportion of phosphorus, may be obtained in large quantity contiguous to the coal.

Large quantities of these ores are now used to mix with the richer red and specular hematites of Missouri and Lake Superior, which give a very red short iron when smelted alone. America is singularly deficient in one class of iron ore, namely, spathic carbonate, which only exists at a few places, and then more as a vein stuff to lead and other ores than as a workable mineral. The clay ironstones of the coal measures, though tolerably abundant, can only be worked to advantage in a few places, owing to the high price of labour, which renders the cost of such ores too expensive, having regard to the proportion of iron they contain, than the richer ores of the older formation.

Having regard, therefore, to the scattered character of the furnaces, and the great distances from which ores are brought, as well as their general composition, the best parallel for the iron furnaces of America is to be found, not in this country, but in Sweden.

BRITISH AMERICA.

British America.

British America contains coal in the provinces of New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland. The former presents three coalfields, occupying in all no less than 8,000 square miles. The latter exhibits several very distinct localities where the coal abounds. The coal areas have been estimated as follows:—

Nova Scotia	2,500	square miles.
Cape Breton, Sydney District	250	,,
,, Boularderie	104	,,
,, South coalfield	180	,,
Prince Edward's Island	5,000	,,
Newfoundland		

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British America.

The New Brunswick coal measures include not only shales and sandstones, as is usual with such deposits, but bands of lignite impregnated with various copper ores, and coated by green carbonate of copper. The coal is generally in thin seams lying horizontally. It is chiefly or entirely bituminous.

The New Brunswick coalfield is divided into—

1. The Great Northern coalfield.
2. Westmoreland or South-eastern coalfield.
3. The South-western coalfield of Sunbury and Queen's Counties.

We have no reliable return of the actual quantity of coal raised in New Brunswick, but the following table of exports shows with tolerable clearness the rate of progress and the commercial value of this coalfield.

QUANTITIES and VALUE of COAL EXPORTED from NEW BRUNSWICK during the under-mentioned YEARS.

Years.	Countries to which exported.								Total.	
	British Colonies and United Kingdom.		United States.		Nova Scotia.		Other Countries.			
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£	Chaldrons.	£
1855	—	160	—	5,530	—	—	—	20	4,104	5,710
1856	—	376	—	9,570	—	—	—	30	5,602	9,976
			Chaldrons.		Chaldrons.					
1857	—	—	4,878	9,756	178	247	—	—	5,056	10,003
	Tons.								Tons.	
1858	129	148	6,880	13,594	—	—	—	—	7,009	13,742
1859	134	136	11,204	33,500	—	—	—	—	11,338	33,636
			Tons.		Tons.					
1860	—	—	14,002	43,757	413	436	—	—	14,415	44,193
						Dollars.				Dollars.
1861	—	—	17,398	251,674	157	829	—	—	17,555	252,503
1862	2,231	17,944	10,303	103,030	—	—	—	—	12,534	120,974
1863	1,434	12,758	16,277	161,994	—	—	1	10	17,712	174,762
1864	1,535	11,863	17,213	152,337	—	—	—	—	—	—
1865	1,190	5,306	19,556	163,170	—	—	12	48	—	—
			15,062		1,131		Chaldrons.		16,193	
1866	—	—	Chaldrons.	167,558	Chaldrons.	14,373	376	2,585	Chaldrons.	184,516
			607		362				1,345	
		Dollars.		Dollars.				Dollars.	Tons.	
1867	36	175	12,534	125,545	—	—	5	30	12,574	125,545

NOVA SCOTIA.

Nova Scotia.

Nova Scotia possesses three coal regions, of which the northern presents a total thickness of no less than 14,570 feet of measures, having 70 seams whose aggregate magnitude is only 44 feet, the thickest beds being less than 4 feet. The Pictou or central district has a thickness of 7,590 feet of strata; but the coal is far more abundant, one seam measuring nearly 30 feet; and part of the coal being of excellent quality, and adapted for steam purposes. The southern area is of less importance. Besides the Nova Scotia coalfields there are three others at Cape Breton, yielding different kinds of coal, of which one, the Sydney coal, is admirably adapted for domestic purposes. There are here 14 seams above 3 feet thick, one being 11, and one 9 feet.

The following table gives the production of the coal mines of Nova Scotia from 1861:—

——	1861.				1862.				1863.		1864.		1865.	
	Total Raised and Sold.		Sold for Home Consumption.		Total Raised and Sold.		Sold for Home Consumption.		Total Raised and Sold.		Total Raised and Sold.		Total Raised and Sold.	
	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Albion Mines, Picton	150,938	14,117	9,410	4,978	185,064	18,678	9,998	5,553	175,673	23,640	127,401	20,652	205,871	32,713
Joggins	5,139	157	398	157	3,242	105	1,051	105	—	—	—	—	—	—
Sydney	98,720	6,738	33,459	1,920	108,594	3,097	45,868	1,080	102,785	1,588	57,435	3,449	143,995	17,181
Lingan	35,102	198	1,151	53	33,574	630	999	36	35,907	151	29,383	—	62,205	1,468
Marshall Bourinot	7,127	495	245	—	—	—	—	—	—	—	—	—	—	—
Archibold's	5,268	536	2,236	188	7,523	207	1,640	202	26,209	515	43,580	4,884	79,482	9,140
Cowbay Bourinot	—	—	—	—	16,809	135	1,864	—	15,960	—	40,000	—	91,091	—
Gowrie Mines	—	—	—	—	—	—	—	—	11,764	3,306	17,069	4,848	32,427	7,361
Other	6,599	479	2,563	495	18,328	3,432	5,648	1,485	26,677	6,446	44,183	2,145	71,007	11,171
Total	308,893	22,536	54,461	7,784	371,334	26,274	67,068	8,641	394,705	34,646	359,051	35,978	693,078	79,034

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Nova Scotia.

After 1865 the returns in this form are no longer obtainable. The following table we are, however, enabled to construct from the Reports of the Chief Commissioner of Mines for the province of Nova Scotia:—

—	1865, Year ending 30th September.		1866, Year ending 30th September.		1868, Yeas ending 30th September.		1869, Year ending 30th September.		1870, Year ending 30th September.	
	Round.	Slack.	Round.	Slack.	Round.	Slack.	Round.	Slack.	Round.	Slack.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cumberland - -	10,225	1,377	15,008	1,441	9,093	1,010	7,648	867	6,906	978
Picton - -	186,301	24,178	183,244	22,485	126,642	18,209	175,286	22,925	191,465	35,059
Cape Breton - -	399,227	18,984	325,515	14,065	276,045	20,699	287,027	17,292	306,097	27,480
Inverness - -	1,097	113	2,093	1,206	131	—	292	40	15	3
Richmond - -	3,789	726	739	223	12	8	—	—	—	—
Victoria - -	4,955	282	7,828	453	1,633	141	372	45	271	—
Total -	605,595	45,660	561,428	39,873	413,557	40,067	470,625	41,169	504,756	63,520

QUANTITIES and VALUE of COAL EXPORTED from NOVA SCOTIA during the undermentioned YEARS.

Years.	Countries to which exported.						Total.	
	British Colonies.		United States.		Other Countries.			
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£	Chaldrons.	£
1856	—	22,992	—	62,725	—	310	120,668	86,027
1857	—	20,751	—	69,415	—	149	146,284	90,315
1858	No returns.							
1859	—	22,981	—	56,578	—	612	140,159 Tons. 14,622	80,171
1860	No returns.							
		Dollars.		Dollars.		Dollars.		Dollars.
1861	—	186	—	1,608	—	1,425	—	3,219
1862	—	490	—	—	—	1,307	—	1,797
1863	—	115,470	—	679,436	—	1,478	—	796,389
1864	—	110,317	—	684,642	—	11,355	—	806,314
1865	—	151,538	—	1,085,745	—	16,367	—	1,253,650
1866	—	—	—	—	—	—	—	1,073,625

In the year 1867, ending June 30th, 1868, the export of coal from Nova Scotia was as follows:—

—	Tons.	Value, Dollars.
To the United Kingdom -	666	1,443
Newfoundland - -	35,701	78,838
Prince Edward's Island -	9,606	17,056
British West Indies -	820	1,802
United States - -	198,920	400,652
Other Foreign Countries -	7,047	15,372
Total - -	252,760	515,163

TOTAL QUANTITIES of COAL SUPPLIED.

Years.	Large.	Small.	Total.
	Tons.	Tons.	Tons.
1859	240,154	21,158	261,312
1860	286,969	22,539	309,508
1861	300,134	22,536	322,670
1862	304,166	17,442	321,608
1863	327,638	25,813	353,451
1864	376,746	29,952	406,698
1865	554,332	36,984	591,316
1866	472,189	29,481	491,228
1867	—	—	—
1868	375,143	19,039	394,182
1869	371,897	23,960	395,857
1870	395,350	42,774	438,124

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NEWFOUNDLAND COALFIELD.

This field is estimated at about 5,000 square miles. According to Mr. Jukes, now director of the Geological Survey in Ireland, the entire western side of the island, along a space of 356 miles in breadth, is occupied by secondary and carboniferous rocks. The coal on the south-western point of the island has been traced at intervals along a space of 150 to 200 miles to the north-east.*

CALIFORNIA.

Colonel Fremont states that a coal formation exists in Upper California, North lat. 41½°, and West long. 107½°. "The position of this coal formation is in the centre of the Rocky Mountain chain, and "its elevation is 6,820 feet above the level of the sea. In some of the coal seams the coal did not "appear to be perfectly mineralised, and in others it was compact and remarkably lustrous."—*Fremont's Report*, 1843. California.

In 1847 a coal mine was discovered near San Luis Obisco, North lat. 35°. There are three coal mines within 300 miles of Monterey.

"The coal or lignite mines of Mount Diable have not been worked so extensively the past year as was expected, in consequence of the unusually large importation of foreign coal. About 20,000 tons have reached this market, which have been sold at from 28*s.* to 36*s.* per ton."†

COAL on the LINE of the UNION PACIFIC RAILWAY.—Correspondent to the STANDARD. May 21st, 1869.

"Ogden, Utah, U.S., April 28.

"Four miles west of Sherman, in the Black Hills, the spot from which my last letter was dated, there is a most remarkable temporary bridge on the Pacific Railway, a tressel-work construction, a very puzzle in woodwork, which crosses a small gorge, through which a trout stream, known as Dale Creek, winds peacefully. The bridge is 125 feet high, and over 500 feet long. All the timber used in its construction was brought from Chicago, and the complete bridge was erected in thirty days. Sooner or later it is to be superseded by a more substantial structure. A little further on, at Laramie, a town has sprung up suddenly which is rather too much like Cheyenne, described in my last communication. A shooting 'affair' occurred the day before our arrival, and it is not very long since the citizens had to invoke the powers of Judge Lynch. I have a photograph of an execution which took place last autumn. The victim, a pretty hard-looking case, was hung on a telegraph pole in front of the Railway Hotel, which latter, by the bye, is a good house erected by the company. The Laramie mountains are timbered, and abound in game, but will tempt few but those of unlimited leisure, as they are 60 miles from the town.

"A discovery of the greatest value has been made on the line of the Union Pacific Railway. A coalfield, almost unlimited in extent, showing indications, 'out-croppings,' for three hundred miles on the road, has been 'struck' in Wyoming territory, in the very heart of the Rocky Mountains, a little beyond Laramie. When, then, this inter-oceanic project was first mooted, it was urged that a line of 1,100 miles in length could not be worked to profit through a treeless, coalless, barren country. And now at this moment the locomotives are fed almost entirely by coal, worked by the company itself, or by contractors who furnish it at a low price. All the coal for fifteen miles in the 'alternate sections' on either side of the line is owned by the company. There are six mines in working order; there are others in progress. I paid a special visit to the principal mine at Carbon Station, one which has yielded 4,000 tons to the railway company in the first three weeks of this month. A little town of 250 inhabitants has sprung up around the mine, although it only dates its existence from August last year. I walked through the whole of the 'drifts' (tunnels); there is one already 540 feet in length. There is an excellent shaft, with the usual gear, pumps, &c., worked by steam power. The thickest part of the seam so far opened is nine feet high. Hitherto, neither fire nor choke damp has troubled the miners; but there is a certain amount of water in the deepest parts. The miners are just now in clover, earning from seven to twelve dollars a day. Last winter they 'struck' for higher wages. The same evening a snow storm came on, which eventually resulted in a blockade of five weeks. The company had coal in hand, and nothing could be done during the interruption of the traffic on the line; they therefore allowed the men to strike to their heart's content, and even obliged them to remain idle for two weeks longer, when they were glad to resume work on the usual terms.

"The coal is of good quality. There is neither bitumen nor sulphur in it. It contains, by analysis, nearly 60 per cent. of carbon, 12 per cent. of water, and 26 per cent. of inflammable gases. It is to bear a new name, one which is perhaps tolerably appropriate. It is to be called 'anthra-lignite.' And as coal has been sold lately in Omaha, on the Missouri, at the rate of 4*l.* 5*s.* 6*d.* a ton (27 dols. 50c.), and as the company will probably sell it at half that price, it will be seen that the discovery is one of the greatest importance to the whole central portion of the continent. Iron ores have been found near it, and I was shown a good collection of coal fossils at the Carbon Station. A coal seam has also been recently discovered at Elko, on the Central Pacific Railway (the continuation of the Union Pacific line, and which forms with it the Pacific Railway).

"Proceeding on our journey we passed, between Separation and Creston stations, the true 'divide' of the Rocky Mountains. There, at a height of 7,700 feet, the waters commence to run in different directions towards their mother oceans. But of the mountains themselves there is little to say; Long's Peak and Elk Mountain were both visible, but in the far distance. At Bitter Creek, a place dreaded by the overland emigrants of less happy days, we got a capital breakfast, which included antelope, beef, eggs, and even pie. The water needed for the tanks of the railway company is brought from a distance to this point in metal lined box cars.

* General Report of the Geological Survey of Newfoundland, by J. B. Jukes, M.A., &c., 1843. See also Extract of a Narrative of Exploration, by Alexander Murray, Esq., published in Reports on Coal.

† Report by Mr. Consul Brooker on the trade of California for the year 1844.

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"At Black Buttes and Point of Rocks stations we saw the openings leading into two of the new coal mines. The latter had a 'shoot' capable of holding coal enough to fill 100 cars (ten tons each). The same place is also the stage station for the new Sweetwater gold mines, of which we hear most conflicting accounts. Many of our passengers left us there. And now we again passed through a terribly barren country, the alkali lying about like snow drifts, and huge and towering crags of sandstone rising high above the more crumbling shale. Gustave Doré ought to come here. During the progress of an extensive 'cutting' for the railway, some of the shale suddenly fired up, whether by artificial or natural means, no one knew. The workmen were frightened out of their senses. Soon a dense cloud of black smoke gathered over the spot, and at night the works were illumined by the fitful glare. Many believe that 'ile' will be found in this neighbourhood, and the non-bituminous nature of the coal may be a point favouring the idea. We saw, too, many of the underground houses of the station *employés*, who till very lately had to live much in the style adopted by the natives of Alaska. At Green River, and later at Bryan, we passed two towns which were 'to let,' the inhabitants having for the most part deserted them with the onward progress of the railway."

OREGON TERRITORY.

Oregon. Coal has been discovered and worked in Wallamette Valley, nearly 100 miles above Oregon City; and anthracite has been observed by Sir George Simpson about 30 miles up one of the tributaries of the Columbia River.

BRITISH COLUMBIA.

BritishColumbia. The Vancouver Coal Company raised last year about 40,000 tons of coal at Nanaimo, of which a considerable quantity found its way to San Francisco, in spite of an unfavourable tariff.

Reports on the Nanaimo Coalfield.

From Report of Dr. James Hector, Geologist to the Government Exploring Expedition under the Command of Captain Palliser (1857–1860), *in the Quarterly Journal of the Geological Society for November* 1861.

At Nanaimo, as on Newcastle Island, there are two seams, the "Newcastle" and the "Douglas," the first of which is everywhere about six feet in thickness, with sometimes a floor of fire-clay, but more generally of sandstone, and the roof consisting of a fine conglomerate bed, about 60 feet thick, on which rests the Douglas seam, with an average thickness of from three and a half to four feet. The roof of this seam is sometimes of iron clay shale, but more often of the same tough conglomerate that it rests upon. On Chase River, one and a quarter miles to the south, the outcrop of a seam has been discovered and worked to a small extent, which they consider to be the "Newcastle seam;" and as it occurs right in the line of strike, and as they have ascertained the outcrop at several points, it is probable that the beds of coal are continuous.*

The existence of coal or lignite on the Pacific coast of quality fit for the purposes of raising steam is of great commercial importance, and that obtained from Nanaimo is as yet admitted to be the best in the market. If these beds are, therefore, discovered to be persistent, so that they can be worked to advantage on a large scale, there is little doubt that this coal, even though it be an imperfect substitute for the finer coal to which we are accustomed in this country, will form a valuable source of wealth to the new British colony. *Already it is extensively used by the British Navy on that station*, and it was found to require only a slight modification in the method of feeding the fires to make it highly effective as a steam generator.

From Report of Hilary Bauerman, Esq., communicated by Sir R. Murchison, in Geological Society's Journal for 1860, *p.* 201.

Two seams of coal, averaging six to eight feet each in thickness, occur in these beds, and are extensively worked for the supply of the steamers plying between Victoria and Frazer's River.

The coal is a soft black lignite of a dull earthy fracture, interspersed with small lenticular bands of bright crystalline coal, and resembles some of the duller varieties of coal produced in the South Derbyshire and other central coalfields in England.

In some places it exhibits the peculiar jointed structure, causing it to split into long prisms, observable in the brown coal of Bohemia.

For economic purposes these beds are very valuable. The coal burns very freely, and yields a light pulverulent ash, giving a very small amount of slag and clinker.

From Facts and Figures relating to Vancouver's Island and British Columbia, by J. Despard Pemberton, Surveyor General, V.I.

The town of Nanaimo, comprising as it does some fifty or sixty buildings, steam engines, tramways, and piers, is very picturesquely situated on the north shore of an excellent harbour, backed by a range of hills some 3,000 feet high. In the harbour and rivers salmon abound, and excellent spars are found in the immediate neighbourhood. *So great are the facilities for shipping coal that at any time of the year* 1,000 *tons a week can be removed without inconvenience.*—P. 17.

About Nanaimo the prevailing rock is sandstone, varying in texture from the hardest conglomerate and millstone grit to a soft and workable building stone. The harbour is admirably sheltered and easily approached; vessels draw close alongside a wharf to load. There several beds of excellent coal are found, nearly horizontal, but dipping sufficiently towards the south and west for drainage, and generally roofed with sandstone. They are all worked within 50 or 60 feet of the surface, and are found cropping out on the islands for several miles inland, and high up the Nanaimo River towards

* Since confirmed by actual investigation.

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the interior of the island, which will give some idea of their vast extent. They are used in Her Majesty's steamers, those of the Hudson's Bay Company, and the river steamers.—P. 46. British Columbia.

The greatest portion by far of the coals consumed in San Francisco is English, and they also consume for domestic purposes as much Vancouver's Island as Oregon coal. The observations previously made on this head show that the prospects of finding coal suitable for steam purposes in Vancouver's Island are much more promising than in Oregon. At present, say San Francisco pays 5*l.* a ton for English coal, while Nanaimo coal is sold at 1*l.*, and adding $3 to 4$ freight, and 24 per cent. duty on the cost of production, Nanaimo coal will still be the cheapest in the market ; *and we see a certainty of sale for all the coal suitable for steam purposes that Vancouver's Island or British Columbia can produce ;** and how great the consumption is may be conjectured from the fact, that a year ago the aggregate tonnage of San Francisco steamers exceeded 35,000 tons, a figure which must since then (1858) have materially increased.—P. 77.

The following from the Vancouver Coal Mining and Land Company is in reply to an application made to the secretary for information:—

SIR, (London, 6th February 1869.)

IN reply to your request of 30th ultimo, in respect of the coal workings of British Columbia, I have the pleasure to give you the following data.

The coalfield worked by this company is at present the only one producing any yield in the Pacific colonies of Great Britain. It is situated at Nanaimo, a settlement of Vancouver Island, and the company has no information of the existence of coal on the mainland, which is British Columbia.

There are outcroppings of coal in Vancouver Island to the north of Nanaimo, at a place called Comox, and again to the west, about eight miles inland, but as no successful borings have yet been sunk, very little that is stated of them is reliable. Workings are being carried on at Queen Charlotte's Island, but they are said not to have been hitherto prosperous.

The output at Nanaimo averages 40,000 tons a year. The seam is one of four feet thick, bituminous coal, has a dip of 30°, and is a good deal disturbed by faults. The coal is consumed for domestic purposes, is used for the manufacture of gas, and also for steam navigation.

I am,
Sir,
Your obedient servant,
SAMUEL M. ROBINS,
Secretary.

Coal supplied from these works at San Francisco, for gas works principally, at $12½ the ton, 48*s.*

Anthracite coal from Pennsylvania, all sent round Cape Horn, is used for the steamers. Some few mix the Nanaimo coal with the anthracite. The Nanaimo coal burns rapidly with flame.

The naval steamers coal at the mine, where there is a good coal station. Coal $6, free on board.

All round the N.E. coast there is coal. The Honourable Mr. Lassells attempts works, stopped hrough the want of money.

Australian coal sent as ballast to San Francisco.

The following returns from Vancouver's Island gives the total sales of coal—

	Tons.
1863	21,394
1864	28,632
1865	32,819
1866	25,115
1867	31,239
1868	44,005

TEXAS.

Coal is known to exist in Texas, though the country has not been geologically examined. The "Trinity Coal and Mining Company" was incorporated by the Texan Congress in 1840, who worked both anthracite and a semi-bituminous coal. Kennedy, in his work, "Texas, its Geography, &c.," says, "Coal, both anthracite and bituminous, abounds from the Trinity River to the Rio Grande." Texas.

MEXICO.

On Salado River coal is worked by an American company. A coal formation 50 miles in breadth crosses the Rio Grande from Texas into Mexico at Loredo, and on the Mexican shore, within 200 yards of the Rio Grande, a remarkably fine vein of coal eight feet thick occurs. Mexico.

SOUTH AMERICA.

In the republic of New Granada, especially at Santa Fe de Bogota, coal occurs ; also in the island of Santa Clara, and brown coal in the province of Panama. South America.

VENEZUELA is said to contain coal, but whether brown or bituminous coal does not appear certain.

PERU appears to possess some coal, but a fossil charcoal of considerable value is more abundant.

CHILI.

The coal of this district has been examined by many American engineers, and by Captains Fitzroy and Beechy and Mr. Darwin. In 1844 upwards of 20 coal mines were open in the neighbourhood of Conception. At Tulcahnano a new seam of four and a half feet was proved. The coal is described by W. R. Johnson as "in external appearance nearly related to many of the richest bituminous coals Chili.

* This view is, in fact, confirmed by a letter received lately from the island, mentioning that the tonnage carrying coal from Nanaimo in the month of January last had increased to 2,000. The price of Nanaimo coal at the pit's mouth varies from four dollars to six dollars.

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Chili.

of America and Europe;" and Mr. Wheelwright in his report on the mines and coal of Chili says, "in fact, the whole southern country is nothing but a mine of coal."

The production of coal in foreign countries says La Houille, even those which are most remote, is a subject of great importance to the French production; for as workings start into existence in non-producing countries, the demand for English coal, so uniform and profitable for English merchants, diminishes.

The result of this is a temporary augmentation of stocks, generally followed by a reduction of prices, which in its turn facilitates competition with our own coal. On the other hand, this question is of primary importance in connexion with steam navigation. Thus we have always been careful to point out the actual or possible development of the product on in all countries, and we propose, in the present instance, to reproduce the report made by Mr. V. Pons, chief engineer, on the nature and quality of the coal of the mines of Lota (Chili), as exhibited in experiments tried in March 1869, with the steam-boat "Mégère." This coal is of a close-burning nature; its colour is a deep grey; its fracture bladed, or in regular grains; being handled it soils the fingers but little; lights and burns very easily, giving a long white flame; it emits a very black and abundant smoke; it is only slightly pyritic; gives little cinder, but a considerable quantity of dirt. First experiment.—Lota coal alone used; passage from Lota to Talcahuano. During this passage of five and a half hours we employed the Lota coal without admixture, the boilers being put in the best possible condition, the tubes swept, and the furnaces cleaned. The trial was conducted with the greatest surveillance, the object being to compare this combustible, by the operation of the engine, with that which has been generally used here (Cardiff coal), both in regard to consumption and calorific power. In the first place I find that the consumption greatly exceeds that which has hitherto been our extreme limit, whilst the result is very nearly the same; but I observed that during the first hours of the passage, that is, before the grating became too dirty, the pressure in the boilers was well maintained, and exceedingly uniform a result always difficult to be obtained when using coal of inferior quality, in spite of good management and a well-constructed furnace. With regard to calorific power, this coal may be placed amongst the dry kinds of good quality, for we have been able, by employing it alone, not only to obtain results previously obtained with every other kind of coal of reputed superior quality, but even at times to surpass those results. This coal has, however, certain drawbacks which it is my duty to point out. Only this surface of the layer burns. Being thrown into the furnace, a quantity of gas is emitted, forming a bright and long flame, but of short duration, whilst the residuum is left incandescent on the grate; a defect which may in part be obviated by small and frequent charges. The quantity of dirt produced, moreover, is considerable, and this is injurious to the draught, and necessitates the frequent cleaning of the furnaces. This deposit, sometimes from 2·36 in. to 3·15 in. thick, is quite loose, yielding to the slightest touch, does not adhere to the grate, mixes with the coke, and is hurtful to the quality of the coal by reason of the frequent and difficult cleanings. It also gives an abundance of smoke, which makes the tubes very dirty.

Second experiment.—Mixture of one-third Cardiff and two-thirds Lota; passage from Talcahuano to Valparaiso. The result of this mixture is a sensible improvement. 1st. The increased production of steam, and the increased pressure, being uniformly maintained without much difficulty, even with an accumulation of dirt, we often manage to heat with the doors of the ash holes closed, and to burn a part of the cinders. 2nd. The dirt deposit on the grates, although still very great, has diminished with the addition of Cardiff coal, so that the stokers experience less fatigue than when Lota coal alone is used, which necessitates a continual cleaning and feeding of the furnaces. 3rd. I must remark that the improvement noted above in favour of this mixture is manifested only to a feeble extent in point of consumption.

I may say that having filled the furnaces on one occasion during this second passage with Lota coal alone, we obtained pressure in forty minutes, which we had never done since our departure from France; for whatever the quality of the combustible employed up to the present time, this has never been accomplished in less than 1h. 10m. This coal, therefore, during its rapid combustion, develops a considerable quantity of caloric. Now, if the preceding remarks be considered carefully and impartially, this first mixture must be regarded as a good and advantageous one for steam navigation.

Third experiment.—Mixture of half Lota and half Cardiff; passage from Talcahuano to Valparaiso. The advantages I remarked in the second experiment with regard to the production of steam, and the regular fire which may be obtained without difficulty, are still more manifest and marked in this third experiment. Then, although the deposit on the grate remains very nearly the same, that is always considerable, it was at first friable, but has now become more compact and hard by combination with glutinous matters emitted from the Cardiff coal during combustion.

Thus, it no longer mixes with the coke, the operation of cleaning is facilitated, a more regular heat is obtained, and consequently an increase of steam-power. Again, although with the mixture of Cardiff and Lota coal the consumption is still very great, I attribute it, not only to the rapid combustion of the latter, but also to the necessity of frequently cleaning the furnaces. Except in this particular, therefore, the mixture is of good quality, and is superior to the first.

TABLE showing the Consumption and Steam-power obtained with different Kinds of Coal.

Kind of Coal.	Average Tension of Steam.	No. of Movements per Minute.	Consumption per Hour.	Cinders. Per-centage of Coal consumed.
Cardiff and Newcastle -	100	65	750	10
" " - -	95	62	780	13
Patent fuel - -	95	63	800	12
Cardiff - - -	100	64	715	10
Lota - - -	105	64	1,042	8
Lota, and one third Cardiff -	100	63	980	7
" " half " -	100	63	900	6

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CENTRAL AMERICA.

"The southern branch of a river called Hone Creek, running into the Atlantic at Coita Bay, passes "through and lays open, on either side, a bed some 50 feet long and 20 feet deep; and similar indica- "tions, though only extending to a depth of a few inches, exist at other points." Report of Hugh Fraser to Earl Russell. Lignite.

It appears that this deposit is only a bed of lignite; it has "been judged to burn too quickly and "with too much flame for use in sea-going steamers."

COLOMBIA, UNITED STATES OF.

The "Diario Official" of October 31st, 1865, contains a report from John May, an engineer in the employ of the Colombian Government. He states that in the province of Rio-Hacha, situated at the north-west corner of Colombia, on the banks of the Serrejon River, about 5 leagues from Barranca, and equidistant from the towns of Rio Hacha and Maracaibo, he has discovered "immense deposits of "bituminous coal," "of that variety called 'cannel.'" United States of Columbia. Cannel coal (?) 1864.

Although Dr. Tomas Cuenca, Secretary of State for Colombia, orders Mr. May to proceed to form a joint-stock company for the construction of a railroad to the sea, and for the working of the mines, it appears doubtful from Mr. May's report whether or not he has really discovered old coal. He speaks of this "cannel" coal in immediate connexion with "thick beds of coal or lignite in a friable state, with "remains of fishes, and fine specimens of selenite. The exaggerated style of the report necessarily creates some doubt as to its entire reliability.

BRAZIL.

The following communications from John Miers, Esq., F.R.S., and from Mr. N. Plant, give all that is known respecting the two coalfields of Brazil:— Brazil.

(*From John Miers, Esq., F.R.S., 84, Addison Road, Kensington.*)

The coal mine for which the Visconde de Barbacena obtained a privilege is in the province of Sa. Catharina, where extensive deposits are found in a district near the junction of two small rivers flowing from the Serragerul de Sa. Catharina, and which unite to form the Rio Tuberao, which runs eastward for about 70 miles, when it enters the Lake of Laguna, in lat. 28°. 23′. S. The lake or bay is sufficiently deep and capacious, and is available for sea-going vessels with a draft of 11 feet, which is the depth of water over the bar in its mouth. The Rio Tuberao is navigable by vessels of that capacity as far as Piedade, which is 27 miles from the point of its entrance into the bay; but above that distance the river is only navigable by smaller craft for a few miles; so that Piedade will be the shipping port or the coal, which will have to be conveyed by a tramway from the mine, 45 miles long, along a course nearly due east and west, upon a gentle gradient. At that distance not less than 20 different scites have been seen on both sides of the Tuberao where the coal deposits crop out, the river running over similar beds. This district is situated in a beautiful and well-wooded country, about 880 English feet above the level of the sea, and upon the northern flanks of the Morro de Sa. Martha or de Congouhas, a spur of the main serra that extends for a long distance parallel with the coast. This spur runs eastward, and terminates at a point 4 leagues south of Laguna. This coal formation is evidently of considerable extent, for similar deposits are found on the southern flanks of the same spur, near the sources of the Rio Araranguà, which runs eastward, and falls into the ocean in lat. 28°. 48°. S., and which is navigable for a distance of 20 miles to Tresportes, where it is broad and deep. The Visconde Barbacenas mining ground is on the Rio Bonito, an affluent of the Tuberao, where the coal shows itself wherever the surface of the hills have become denuded by gullies formed by springs, presenting cliffs 40 feet high. Here the coal deposits are visible to a depth of 10 to 14 feet, and these are covered by a roofing of hard sandstone 20 feet deep. Immediately below the upper bed is another layer of coal 6 inches deep; then a stratum of grayish schist with fossil vegetable remains, succeeded by a bed of good solid coal 8 feet thick; then a layer of black schist, and another bed of coal 1 foot thick. How much deeper these beds may be is unknown, as the ground has not been bored; but it is probable that deep beds of more valuable coal exist. There is, however, a sufficient store above ground to admit of extensive workings without the necessity of sinking shafts, or of the ordinary expense of raising the coal to the surface by means of steam machinery. The existence of a thick sandstone roofing, containing vegetable impressions, offers good promise as regards this coal formation. The samples exhibited in the Paris Exhibition brought from this mine were much broken by long carriage, but they showed a tolerably bright coal of a very laminated structure, with indications of pyrites scarcely visible; but it is not unlikely that seams yet undiscovered may elicit a coal of a still better quality. This coal formation has been surveyed by many persons, and the above information was mostly derived from a gentleman who carefully inspected it. To Brazil these deposits are of far greater value than her celebrated gold mines, offering a source of wealth which ought not to be neglected; they offer better promise, from the facilities that exist of sea conveyance. It would be useless to attempt working these mines without the command of sufficient capital, and this could only be done by the Government, or by a company. The formation of such a company in Brazil seems hopeless at present; but in England it might readily be done, provided the Government would give some guarantee or afford sufficient protection to the contracting parties by the concession of certain privileges; but the initiative must be taken by the Government, and in such case there would be no lack of capital to any extent required. The amount of this fuel (rendered more expensive by its long voyage from England) now consumed in Brazil is very large, and is always on the increase, owing to the rapid development of the coasting traffic; and if Brazilian coal could be brought to substitute this large foreign supply, the advantage to the empire would be very great. This is a national question that rests entirely with the Government; it is, however, one of considerable importance, which demands its especial consideration.

The second sample of Brazilian coal exhibited in Paris was scarcely equal in quality to the former, and seemingly was more slaty and more charged with pyrites. This was brought from a mine in the

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Brazil.

province of Rio Grande do Sul, which has been scantily worked for several years, but hitherto with little encouragement. It is situated on the Arroyo dos Ratos, a small stream that runs into the Rio Jacuhy, about half a league distant from S Jeronymo, which is near 16 leagues to the westward of Porto Alegre, the capital of the province, and which has an excellent water conveyance between it and the seaport town of Rio Grande; but with all the advantages of easy transport, the coal has not been able to obtain a good reputation among the owners of the numerous steam vessels that are constantly plying between the places above mentioned, for which traffic English coal, notwithstanding its high price, is always preferred. This want of success, notwithstanding the perseverance of the owners in working the mine for several years, is remarkable. By some it is attributed to the inferior quality of the coal, which is said to contain 25 per cent. of earthy matter; while others, on the contrary, deny this assertion, and aver that an unfounded prejudice has been raised against it solely by opposing interests and powerful intrigues.

There is another extensive deposit of coal in the same province, for the working of which a privilege has been obtained by Mr. Nathaniel Plant, and which is said to be a coal of very good quality; but its distance, too far inland, and the want of water conveyance, are said to be great obstacles against the probable success of any attempt to work it in the present state of the country.

The only localities on the eastern coast of South America, between the River Amazon and the River Plate, where the existence of coal has actually been determined, are the two southern Brazilian provinces of Saõ Pedro do Rio Grande do Sul and Santa Catherina, and the neighbouring republic of Banda Oriental, or Uruguay.

Lignite, brown coal, and bituminous schists, to which the name of "carvao de pedra," stone coal, has been applied in Brazil, occur in thin beds along the coast and in the interior; but it is only in the two extreme southern provinces and the adjoining republic of Uruguay that beds of bituminous coal containing palæozoic fossils have yet been discovered. Nor should I think it likely, from the observations have made during many years in nearly every province of the Brazilian Empire and the republics of the River Plate, that coal of so early an age as even the lower oolitic rocks will ever be found in Brazil north of the province of Santa Catherina, unless it be in the adjoining one of Paraná.

In the province of Saõ Pedro do Rio Grande do Sul, three distinct coal basins have been discovered, and the extent and thickness of the beds of coal to some degree determined. The district in which these coal deposits are found is contained within the limits of latitude 30° and 32° and long. 51° and 54°. The basins are separated from each other by rolling hills of granite, sienite, and mica schist.

The largest of these coal basins is perhaps that occupying the vallies of the rivers Jaguarao and Candiota, between lat. 31° and 32° and longitude 53° and 54°, called the Candiota coalfield. A detailed report of this appeared in the "Reports from Her Majesty's Secretary of Embassy and Legation "respecting Coal, 1867," to which I refer you. Along a line ranging from N.E. to S.W. the upper coalbeds of this deposit can be seen at intervals for about 50 miles, where the superincumbent sandstone has been denuded, or the strata worn through by streamlets, and the same may be observed from N.W. to S.E. for about 30 miles.

The falling away of one side of a hill some years ago on the banks of the River Candiota, near the basset-edge of the basin, laid bare five beds of coal, varying in thickness from 9 feet to 25 feet, giving 65 feet as the total thickness of coal exposed. The coal from the lower beds, which are also the thickest, is highly bituminous; but that from the upper one is shaly and poor.

The second basin lies in the valley of the Sa. Sepé, one of the tributaries of the River Jacuahy, in about lat. 30°. 20′ and long 53°. 30′. Two beds appear here, one of 7 feet and the other of 14 feet, which have been traced over an area of some 15 miles, and along the margins of other neighbouring streams. The coal in this deposit underlies sandstone, like that of Candiota.

The third basin is near Saõ Jeronymo, a town on the banks of the River Jacuahy, in about lat. 30° and long. 51°. 30′. This is the only coalfield being worked at the present moment on the eastern side of the Andes, on the S. American continent. Although the beds of coal in this deposit are of less thickness than those of Candiota and S. Sepé, the nearness of the basin to the port of embarkation at the town of Saõ Jeronymo, which is only 8 miles distant from the coal, renders the cost of land carriage very trifling, compared to what it would be from the other two fields, to a navigable river.

Two shafts have been sunk in this basin to a bed of coal 6 feet thick, and a horseway made into it, along which the coal is drawn to the surface. Borings have been made in different parts, by which it has been ascertained that the whole basin spreads over an area of about 20 miles, and that other beds of coal exist under the 6 feet seam.

Owing to the want of miners and machinery to work this mine on a large scale, the average amount of coal being taken out at present does not exceed 200 tons per month, which is barely sufficient to supply the steamers navigating the River Jacuahy. This river falls into the Lago dos Patos, which has its outlet in the Atlantic Ocean at the seaport of Rio Grande do Sul. The coal is said to be as good for steam purposes as Newcastle coal, with the exception of leaving more ash.

The coalbeds in the republic of Banda Oriental are situated on the head waters of the River Negro, between lat. 31° and 32°, long. 54° and 55°, where they can be traced for several miles along the margins of the river and some of its tributaries; the beds vary in thickness from 3 to 6 feet.

The coal deposits actually determined and surveyed in the province of Santa Catherina are at Boa Vista and at the head of the River Tubarao, at "Passa-dous," between lat. 28° and 29°, long. 49° and 50°. Here beds of coal of considerable thickness can be seen along the margin of the river, and appear to extend over an area of several leagues, though the limits of the deposits have not yet been ascertained. The fossil plants found in this coal are of the same character as those found in the ironstone shales interstratifying the coalbeds on the River Candiota in the province of Rio Grande do Sul.

The annual amount of coal consumed in Brazil and the River Plate is upwards of 500,000 tons.

Beds of bituminous schist extend over considerable areas at Missão da Corda, on the River Mearim, and in the valley of the River Itapicurú in the province of Maranhão, and, associated with lignite, it is found along the margin of the River Camaragibé in the province of Alagoas, also at the mouth of the River Camamú in Bahia, and in various parts of the province of Pernambuco. From experiments I have had made in England, these schists yielded from 15 to 20 °/₀ of crude oil, though some specimens I saw in Pernambuco were so rich in oil as to readily ignite when applied to the flame of a candle.

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Lignite and brown coal are found in thin isolated beds in many places along the coast of Brazil, and in the provinces of Minas Geraes, Goyaz, and in the valleys of the Ribeira de Iguape and Tieté in Saõ Paulo.—*May*, 1868. NATHANIEL PLANT. Brazil.

THE WEST INDIAN ISLANDS.

Cuba, in the vicinity of Havannah, produces a kind of asphaltum much resembling coal, the analysis of which gives,—carbon 34·97, volatile matter 63·00, ashes 2·03. At New Havannah a similar combustible is found; but it contains 71·84 of carbon. True coal does not appear to have been found in Jamaica. Sir H. De la Beche, *Trans. Geological Society of London*, describes three or fourth in seams of coal imbedded in shale near the north-eastern extremity of the island.

BARBADOES.

Bitumen is found plentifully, and on Grove Plantation estate a good coal is stated to have been found.

TRINIDAD.

The pitch lake of this island is well known. Near it, and it is believed extending under it, a true coal of superior quality is worked.*

ARGENTINE CONFEDERATION.

All coal imported into the Argentine Confederation appears to be English coal, although it is entered in the Custom House return as being received from several countries. The price of coal in 1864 was 6*l.* per ton. A coalbroker's return is relied on by Mr. Pakenham in his return in answer to Earl Russell's circular requesting information on coal. The returns given are as follows:—

	Tons.
Year ending October 1859 - - -	23,395
„ „ 1860 - - -	30,416
„ „ 1861 - - -	27,636
„ „ 1862 - - -	26,668
„ „ 1863 - - -	27,489
„ „ 1864 - - -	26,609

A return is given for 1864 from the Custom House statement of duties as - - - 13,472 tons, paying duty a trifle less than 1½ dollars per ton, and duty free - - - - 5,831 „ for railroads and gas.

Total - -	19,303

* See Report of the Geology of Trinidad by G. P. Wall and J. G. Sawkins in Memoirs of Geological Survey, 1860.

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APPENDIX TO THE REPORT OF COMMITTEE E.

Circular E 1.

Committee on Mineral Statistics
(Royal Coal Commission),
Room G, House of Lords.

We are directed by the Royal Coal Commission (of which we form the Committee on Mineral Statistics, E,) to invite you to furnish us with replies to the following questions. In soliciting your attention to this important division of this national inquiry, we beg to assure you that it is not the intention of the Commission to publish in any form the detailed statements furnished from individual collieries. Their only object is to ascertain with all possible accuracy the production of coal in the various coalfields. and the uses to which that coal is applied.

The Commissioners have no doubt that the information you can furnish will be of great service, and enclose for your consideration a copy of the Royal Commission under which they act.

We are, Sirs,
Your obedient servants,
RODERICK I. MURCHISON.
ROBERT HUNT.

These queries when answered, and all inquiries relating to them, should be sent addressed—
"Royal Coal Commission," Committee E.
Museum of Practical Geology,
Jermyn Street
London, S.W.

COAL PRODUTION AND CONSUMPTION.

	1866.	
	Coal.	Small Coal, Slack, &c.
1. The name and situation of colliery - -		
2. The name of firm or individual working the colliery		
3. The total quantity of coal raised in statute tons of 2,240 lbs. - TONS (*It will be important if answers can be obtained according to the following form.*)		
4. The distribution of the coal from above colliery:—		
(*a.*) Colliery consumption (engines, fires on bank, allowance or workman's coal, if any) - - -		
(*b.*) Used in iron works:—		
1. Blast furnaces - -		
2. Mills and forges -		
3. Foundries - -		
(*c.*) Used in metallic mines -		
(*d.*) Do. smelting works (other than iron)		
(*e.*) Do. lime burning -		
(*f.*) Do. potteries - -		
(*g.*) Do. brick and tile works		
(*h.*) Do. gas manufacture -		
(*i.*) Do. waterworks -		
(*j.*) Do. mills and factories -		
(*k.*) Do. other manufactures		
(*L.*) LANDSALE for domestic and other uses*		
(*m.*) Used in making oil - -		
5. The quantity of coal coked?		
6. Do. used for RAILWAY PURPOSES - -		
7. Do. by STEAMSHIPS:		
1. *Coasting trade* - -		
2. *Ocean trade* - - -		
8. What quantity of this coal was sent out of the district by railway or canal?		
9. If sent to ports for shipment,—		
1. How much exported to *foreign parts?*		
2. How much sent *coastways?*		

* "Landsale" is understood to mean all coal and slack sent off by carts.

Circular, E. 2.

Royal Coal Commission, Committee E.
Museum of Practical Geology,
Jermyn Street, London, S.W.
1871.

The labours of this Commission are nearly completed, but it is important that the coal produce of 1870 should be obtained, with accuracy, that a comparison may be made with the production of former years.

We beg to express our thanks for the aid which has been given to our previous inquiries on those matters committed to our care, viz:—

"The annual production of coal and its distribution, and an enquiry as to the quantity of coal at present consumed in the various branches of manufacture, for steam navigation, and for domestic purposes, as well as the quantity exported, and how far, and to what extent, such consumption and export may be expected to increase."

We have now to solicit your attention to the annexed questions, assuring you that your replies will be regarded as strictly confidential, and used for no other purpose than in the computation of the produce of districts. Your early reply will be highly esteemed.

We are

Your obedient Servants,
RODERICK I. MURCHISON,
ROBERT HUNT. } *Commissioners.*

1. Name and situation of colliery or collieries.
2. Name of the firm working the same.
3. Quantities of coal and slack raised (and so used) in 1870, in statute tons.
4. The quantity of coal coked in 1870.
5. Distribution of coal.
   Quantity sent—
   a.—By railway.
   b.—By canal.
   c.—Landsale.
   d.—To ports for shipment.
      1. To foreign ports.
      2. Coastwise.
6. Colliery consumption.
7. Prices of coal at pit's mouth.

Circular, E 3.

Museum of Practical Geology,
Jermyn Street, London, S.W.

We are directed by the Royal Coal Commission to determine, with all possible accuracy, the quantities and varieties of coals used in the various manufactures of the United Kingdom.

We therefore solicit your attention to the following questions, assuring you that the replies with which we may be favoured will be treated as confidential, and used only to enable us to arrive at the total quantities of coal used in each special industry.

RODERICK I. MURCHISON.
ROBERT HUNT.

1. Name of firm or proprietor.
2. Description of manufacture.
3. Number of steam engines at work,
4. Horse power employed { Nominal. / Indicated.
5. Quantity of coal used for steam engines in 1867.
6. Quantity of coal or coke used for other purposes in 1867.
7. Description of coals used.

The issue of this form was repeated in 1868, 1869. and 1870, slightly varied, as follows:

1. Name of firm or proprietor.
2. Description of manufacture.
3. Total quantity of coal or coke used in 1869 or 1870.
4. Number of steam engines employed.
5. Quantity of coal used for the production of steam distinguished from that used for manufacture.
6. Description of coals used.

Circular M. R. O.

Mining Record Office,
Museum of Practical Geology,
Jermyn Street, London,
, 187 .

SIRS,

Allow me to request the favour of your reply to the questions on the adjoining page. The information,—which is desired for the purpose of enabling me to estimate with exactness the production of iron in the United King-

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dom,—will be regarded as strictly confidential, and employed only in computing the returns of districts.

I am, Sirs,
Most faithfully yours,

Keeper of Mining Records.

1. Name and situation of iron works.
2. Owners of iron works.
3. Number of furnaces in blast during the year 187 .
4. Quantity in statute tons of pig iron made in 187 .
5. Quantities of coal used in 187 .
6. Number of puddling furnaces.
7. Number of rolling mills.
8. Number and capacity of Bessemer converters, if any.

Particulars relating to the quantities, character, &c. of iron ore raised and used will be valuable.

Circular, E. 4.

Museum of Practical Geology,
Jermyn Street, London, S.W.

We are directed by the Royal Coal Commission to determine, with all possible accuracy, the quantities and varieties of coals used in the various manufactures of the United Kingdom.

We therefore solicit your attention to the following questions, assuring you that the replies with which we may be favoured will be treated as confidential, if so desired, and used only to enable us to arrive at the total quantities of coal used in the manufacture of gas.

Roderick I. Murchison.
Robert Hunt.

1. Name of gas works.
2. Name of city or town.
3. Quantity of coal used for making gas in 1867 and 1868.
4. Quantity of coal used for other purposes in the works.
5. Cubic feet of gas produced per ton of coal employed.
6. Description of coals used.

Name of Manager or Secretary _____

Circular, E. 5.

Museum of Practical Geology,
Jermyn Street, London, S.W.

We are directed by the Royal Coal Commission to determine, with all possible accuracy, the quantities and varieties of coals used in the several mines of the United Kingdom.

We therefore solicit your attention to the following questions, assuring you that the replies with which we may be favoured will be treated as confidential, and used only to enable us to arrive at the total quantities of coal used in each special industry.

Roderick I. Murchison.
Robert Hunt.

1. Name and situation of mine.
2. Description of ore raised.
3. Number of steam engines at work.
4. Actual horse-power employed.
5. Quantity of coal used for steam engines in 1867.
6. Quantity of coal used for other purposes in 1867.
7. Description of coals used.

Circular E. 6.

Museum of Practical Geology,
Jermyn Street, London, S.W.

We are directed by the Royal Coal Commission to determine, with all possible accuracy, the quantities and varieties of coal used for the production of steam-power within the United Kingdom.

The quantity of coal used in the pumping engines of the waterworks being considerable, we solicit your attention to the following questions. Such replies as will assist us in determining the total quantity of coal used in the waterworks of the Kingdom will be most highly esteemed.

Roderick I. Murchison.
Robert Hunt. } Royal Commissioners.

1. Name of waterworks.
2. Name of place places or supplied.
3. Number and description of pumping stations.
4. Number and description of pumping engines.
5. Actual horse-power employed.
6. Average quantity of water raised per day.
7. Tons of coal used in 1867 and 1868 respectively.
8. Description of coal used.

Name of Engineer _____

Circular E. 7.

Royal Coal Commission,
Committee on Mineral Statistics, E.
1867.

We are directed by the Royal Coal Commission (of which we form the Committee on Mineral Statistics, E.) to invite you to furnish us with such information as will enable us to determine the quantity of British coal used annually by the coasting and ocean steam vessels of the United Kingdom.

To ensure uniformity in the returns, the following questions are submitted to your attention. We enclose a copy of the Commission under which we act, and confidently rely on receiving your aid in determining this important question.

We are, Sirs,
Your obedient Servants,
Roderick I. Murchison.
Robert Hunt.

1. Registered name of company or owners.
2. Number of steam vessels employed by the company or owners.
3. Gross tonnage of the same.
4. If ocean steamers or coasting vessels.
5. Port or ports from which sailing.
6. Quantity of coal in statute tons consumed on the outward voyage in the year 1866.
7. The varieties of coal employed—distinguishing, as far as possible, the coalfields from which obtained.
8. State, if on the return voyages British coal is used, from what depôt obtained, and quantity of coal taken;* or, if not, the name of the colony or foreign port from which it has been derived.

These queries, when answered, and all inquiries relating to them, should be sent addressed—

Royal Coal Commission, Committee E.,
Museum of Practical Geology,
Jermyn Street,
London, S.W.

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* This information is especially required to obviate the difficulty arising from the circumstance that this coal will have appeared in our exports to the colonies and foreign ports.

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APPENDIX, No. 1.

VEND of COALS on the TYNE, 1767.

—	Collieries.	Chaldrons.
1	Wylam Moor	14,000
2	Greenwich Moor	18,000
3	Holywell Main	18,000
4	Montague Main	5,000
5	Bykes	11,000
6	Benton	27,000
7	Walker	12,000
8	Tynemouth Main	13,000
9	Chirton	14,000
10	Chapter Main	8,000
11	Fellon	13,000
12	Huntley's	5,000
13	Team	26,000
14	Tanfield Moor	17,000
15	South Moor	34,000
16	Andrew's House	6,000
17	Hutton Main	8,000
18	J. M. Edge	12,000
19	Silver Top	20,000
20	Pentops	50,000
21	Lunds	5,000
22	Barleyfield	5,000
23	Whitfield	12,000
24	Rise Moor	6,000
	Total chaldrons	359,000
		or
	Total tons	951,350

1768.

Mean vend for three years past 358,000 chaldrons or 948,700 tons.
Intended vend for seven years to come 348,000 chaldrons or 922,200 tons.

The Newcastle chaldron is 53 cwt. of coal, or double the quantity contained in the London chaldron. Sometimes the chaldron was made the long chaldron of 56 or 58 cwt., but the ordinary chaldron was supposed to be adopted by the Committee of the vend.

APPENDIX, No. 2.

VEND of COALS on the WEAR, 1778.

—	Colliery Owners.	Chaldrons.
1	Lord Ravensworth's Representatives	20,500
2	Sir John Eden	19,016
3	Humble and Smithson	17,817
4	Wm. Pearelt, Esq.	9,888
5	Wm. Russell and Company	7,285
6	Carr, Esq., and Company	19,973
7	Mr. Nisham	11,067
8	Ralph Lambton, Esq.	17,958
9	John Lambton, Esq.	13,864
10	Mrs. Lambton	16,788
11	Wm. Pearith, Esq.	9,943
12	Ralph Milbank	19,637
13	Robert Shafto, Esq.	19,743
14	John Tempest, Esq. (Ducks)	25,287
15	John Tempest, Esq. (Wharton Main)	10,264
	Total chaldrons	238,953
		or
	Total tons	633,225 tons

APPENDIX, No. 3.

VEND of COALS on the WEAR, 1779.

—	Colliery Owners.	Half-year.	Year.
		Chds.	Chds.
1	John Tempest (Old Ducks)	11,729	23,241
2	Matthew Carr (Old Washington)	9,178	19,224
3	Ralph Milbank	8,118	16,231
4	John Lambton, Esq.	7,755	16,386
5	Robert Shafto, Esq.	7,195	15,841
6	Lord Ravensworth	6,736	15,609
7	Humbles for Stafford	6,610	15,554
8	Sir John Eden	6,720	14,504
9	J. Nisham	6,120	13,464
10	J. Tempest (Wharton Main)	5,552	11,048
11	Wm. Russell, Esq., and Company	3,160	12,921
12	R. Lambton, Esq.	4,948	12,567
13	Wm. Pearith (Donnisons)	3,896	8,200
14	Wm. Pearith (Chartershaugh)	1,864	6,785
15	Lord Scarborough	696	2,736
16	Mary Lambton	..	13,526
17	Mr. Jolliffe	..	289
	Total chaldrons	98,067	258,696
			or
	Total tons	..	684,044

APPENDIX, No. 4.

REGULATED VEND at WASHINGTON STAITH, 21st December 1775, from Documents in The MINING RECORD OFFICE.

—	Chaldrons.	Chaldrons.
Robert Shafto	6,865	Resting 592
Matthew Carr	3,660	„ 342
John Hudson	5,379	„ 248
Edward Aiskele	4,181	„ 168
John Nelson	2,053	„ 160
	22,138	„ 1,506
Fire-coal vended	386	
Net vend exported	21,752	

VEND at WASHINGTON STAITH from 21st Dec. 1775 to and with 21st Dec. 1776.

—	Gross Vend.	Fire Coal to deduct.	Exported Vend.	Resting upon Staith.
	Chds.	Chds.	Chds.	Chds.
Robert Shafto	7,141	108	7,033	688
Matthew Carr	3,652	135	3,517	381
John Hudson	5,537½	262½	5,275	179
Edward Aiskele	3,651½	135	3,516½	170
John Nelson	1,828	70	1,758	163
Total	21,810	710½	21,099½	1,581

VEND from WASHINGTON STAITH from Dec. 21st, 1777, to Dec. 21st, 1778.

—	Gross Vend, Newcastle.	Fire Coal, Newcastle.	Exported Vend, Newcastle.	Resting, Newcastle.
	Chds.	Chds.	Chds.	Chds.
Matthew Carr	3,364	198	3,166	387
John Hudson	5,024	267	4,757	28
Edward Aiskele	3,284	96	3,188	180
John Taylor, sen.	3,336	168	3,168	351
Wall and Stafford	3,320	152	3,168	357
John Nelson	1,645	62	1,583	127
Total	49,973	943	19,080	1,430

VEND from WASHINGTON STAITH from Dec. 21st, 1780, to and with Dec. 21st, 1781.

—	Exported Vend.	Fire Coal.	Total.
	Chds.	Chds.	Chds.
Mr. Hudson	4,002	99	4,101
Mr. Carr	2,665	69	2,734
Mr. Aiskele	2,671	100	2,771
Mr. Taylor	2,664	144	2,808
Mr. Stafford	2,544	192	2,736
Mr. Nelson	1,333	91	1,424
Total	15,879	695	16,574

APPENDIX, No. 5.

VENDS from the WASHINGTON STAITH for the last half-year of 1777 and the first five weeks of 1778.

1777.	June 25, Nwcstl.	July 2.	July 9.	July 16.	July 23.
	Chds.	Chds.	Chds.	Chds.	Chds.
Robert Shafto	3,921	4,129	4,273	4,449	4,601
Matthew Carr	1,870	2,078	2,166	2,254	2,350
John Hudson	2,708	2,828	2,916	3,028	3,148
Edward Aiskele	1,800	1,848	1,912	1,959	2,078
John Nelson	976	1,000	1,021	1,048	1,112
Total	11,275	11,883	12,291	12,738	13,289

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1777.	July 30.	Aug. 6.	Aug. 13.	Aug. 20.	Aug. 27.
	Chds.	Chds.	Chds.	Chds.	Chds.
Robert Shafto -	4,753	4,905	5,049	5,217	5,385
Matthew Carr -	2,414	2,486	2,574	2,638	2,722
John Hudson - -	3,252	3,372	3,484	3,596	3,716
Edward Aiskele -	2,102	2,214	2,325	2,357	2,445
John Nelson - -	1,136	1,184	1,232	1,272	1,280
Total - -	13,657	14,161	14,664	15,080	15,548

1777.	Sept. 3.	Sept. 10.	Sept. 17.	Sept. 24.	Oct. 1.
	Chds.	Chds.	Chds.	Chds.	Chds.
Robert Shafto -	5,553	5,673	5,793	5,929	6,049
Matthew Carr -	2,810	2,834	2,922	3,002	3,066
John Hudson - -	3,828	3,932	4,012	4,108	4,212
Edward Aiskele -	2,557	2,687	2,733	2,757	2,757
John Nelson - -	1,328	1,344	1,392	1,424	1,472
Total - -	16,076	16,420	16,852	17,220	17,556

1777.	Oct. 8.	Oct. 15.	Oct. 22.	Oct. 29.	Nov. 5.
	Chds.	Chds.	Chds.	Chds.	Chds.
Robert Shafts -	6,169	6,329	6,457	6,577	6,665
Matthew Carr -	3,106	3,114	3,154	3,210	3,322
John Hudson - -	4,308	4,420	4,508	4,636	4,732
Edward Aiskele -	2,869	2,893	2,893	3,061	3,117
John Nelson - -	1,480	1,520	1,520	1,544	1,576
Total - -	17,932	18,276	18,532	19,028	19,412

1777.	Nov. 12.	Nov. 19.	Nov. 26.	Dec. 3.	Dec. 10.
	Chds.	Chds.	Chds.	Chds.	Chds.
Robert Shafto -	6,785	6,801	6,806	6,806	6,818
Matthew Carr -	3,338	3,378	3,402	3,402	3,402
John Hudson - -	4,844	4,900	4,929	5,025	5,089
Edward Aiskele -	3,269	3,285	3,309	3,309	3,309
John Nelson - -	1,592	1,616	1,632	1,720	1,736
Total - -	19,828	19,980	20,078	20,262	20,354

1777.	Dec. 17.	Dec. 31.
	Chds.	Chds.
Robert Shafto -	6,826	..
Matthew Carr -	3,402	16
John Hudson - -	5,233	20
Edward Aiskele -	3,389	20
John Nelson - -	1,776	48
Total - -	20,626	104

APPENDIX, No. 6.

1778.	Jan. 7.	Jan. 14.	Jan. 21.	Jan. 28.	Feb. 4.
	Chds.	Chds.	Chds.	Chds.	Chds.
Mr. Carr - -	16	16	16	88	200
Mr. Hudson -	20	20	52	140	348
Mr. Aiskele - -	20	20	20	100	204
Mr. Taylor - -	..	..	..	64	232
Mr. Wall - -	..	..	..	48	200
Mr. Nelson - -	48	48	120	200	336
Total - -	104	104	208	640	1,520

APPENDIX, No. 7.

An ACCOUNT of the COAL exported from the Ports of NEWCASTLE and SUNDERLAND in each of the following Years.

Years ending 5 January.	Newcastle.	Sunderland.	Total.	Total in Tons.
	Newcastle Chaldrons.	Newcastle Chaldrons.	Newcastle Chaldrons.	
1791	44,922	47,485½	92,407	244,873
1792.	45,714	54,150	99,864	264,639
1793	43,187	53,311	96,498	257,223
1794	33,947	50,064	84,011	222,629
1795	40,063	38,885	78,948	209,212
1796	40,475	5,884	46,359	112,851
1797	43,301	6,298½	49,594½	131,425
1798	38,235	6,434½	44,699½	118,453
1799	44,922	5,111½	50,033½	132,588
1800	43,492	4,039	47,531	125,952

Accounts and Papers, Vol. XVII., 1821, p. .

APPENDIX, No. 8.

AN ACCOUNT of the QUANTITY of COALS EXPORTED from the PORTS of NEWCASTLE, SUNDERLAND, HARTLEY, and BLYTHE, since the Year 1790; distinguishing each Year, and distinguishing also those sent to FOREIGN COUNTRIES, to LONDON, and COASTWAYS to any other Part of GREAT BRITAIN.*

Years.	To Foreign Countries.			Total
	Newcastle.	Sunderland.	Hartley and Blythe.	
	Newcastle Measure.	Newcastle Measure.	Newcastle Measure.	
	Chaldrons.	Chaldrons.	Chaldrons.	Tons. Cwts.
1791	45,702	54,150	127	264,944 7
1792	42,993	53,313½	234	255,832 6
1793	34,105	50,064	48	223,175 1
1794	40,461	38,885	128	210,606 2
1795	40,342	5,884	48	122,625 2
1796	42,778	6,293½	542	131,475 15
1797	38,149	6,434½	32	118,231 2
1798	44,722	5,111½	166	132,498 14
1799	43,366	4,039	127	125,959 16
Total -	372,618	224,175	1,452	1,585,349 5

Years.	To London.			Total.
	Newcastle.	Sunderland.	Hartley and Blythe.	
	Newcastle Measure.	Newcastle Measure.	Newcastle Measure.	
	Chaldrons.	Chaldrons.	Chaldrons.	Tons. Cwts.
1791	326,218	51,759½	28,044	1,075,956 19
1792	358,707	42,571½	29,000	1,140,238 1
1793	357,368	43,035	24,546	1,126,114 17
1794	303,366	59,475	26,197	1,080,950 14
1795	342,540	79,157	20,962	1,171,456 7
1796	329,753	53,406½	20,906	1,069,167 13
1797	348,646	56 978	27,434	1,147,603 14
1798	296,866	68,716	28,661	1,018,243 19
1799	332,165	75,231½	26,642	1,150,202 1
Total -	2,995,629	525,330	226,186	9,929,934 5

* A letter addressed to John Whitmore, Esq., pointing out the impolicy of the proposed measure of obtaining a supply of coal from the manufacturing districts to the metropolis, by Henry Grey Macnab. 1801.

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Years.	Coastways to any other Part of Great Britain.			Total.
	Newcastle.	Sunderland.	Hartley and Blythe.	
	Newcastle Measure.	Newcastle Measure.	Newcastle Measure.	
	Chaldrons.	Chaldrons.	Chaldrons.	Tons. Cwts.
1791	78,149	19,499	11,657	289,658 5
1792	97,399	214,817½	9,400	850,958 14
1793	108,181	211,976½	14,004	885,528 0
1794	84,094	184,464½	11,455	742,035 15
1795	120,956	203,789½	11,132	890,075 8
1796	109,024	196,839½	9,423	835,509 4
1797	110,520	219,603½	12,127	906,963 17
1798	97,503	210,416½	14,172	853,542 9
1799	115,654	223,338½	15,047	938,204 14
Total -	921,480	1,684,245½	108,417	7,192,476 6

Appendix, No. 9.

An Account of the Quantity of Coals exported from the several Ports of the United Kingdom from 1790 to 1799 inclusive, other than the Ports of Newcastle, Sunderland, Hartley, and Blythe.

Years.	Newcastle Measure.		Winchester Measure.		Total Export.
	Chds.	Bshs.	Chds.	Bshs.	Tons.
1790	19,311	18½	230,619	21	345,213
1791	18,718	67½	240,288	12	355,973
1792	15,856	64½	243,886	10½	353,472
1793	10,404	25½	292,713	13	385,777
1794	11,312	41	248,000	17	346,176
1795	5,033	38½	254,648	9	350,737
1796	6,378	1½	258,005	4	390,857
1797	4,669	20½	262,454	32	346,500
1798	5,449	24½	263,343	2	350,201
1799	6,203	63	265,748	31	349,065

Report on the Coal Trade, 1800. Reports Committee 26, 1800, p. 161.

Appendix, No. 10.

Quantities of Coal exported from Ports of Great Britain North of the Humber, since the Year 1795 to 1800.*

Years.	Coastwise.		Foreign, including Ireland.		Total.		Total Export in Tons.
	Tons.	Winchester Measure, Chaldrons.	Tons.	Winchester Measure, Chaldrons.	Tons.	Winchester Measure, Chaldrons.	
1795	135,687	1,495,954	17,147	117,635	152,834	1,613,590	2,210,161
1796	122,551	1,418,850	25,368	126,269	147,919	1,545,119	2,119,945
1797	133,539	1,486,310	19,868	111,605	153,407	1,597,915	2,190,784
1798	149,845	1,355,257	25,666	127,703	175,511	1,482,960	2,066,485
1799	125,900	1,157,304	12,671	124,918	138,571	1,642,222	2,237,404
1800	134,101	1,702,331	19,333	138,407	153,434	1,840,738	2,500,374

Total increase in the six years, 290,213, or 13·130 per cent.

* Accounts and Papers, House of Commons Library, vol. xlv., 1817, p. 258.

Appendix, No. 11.

Account of the Quantity of Coals exported from the several Ports of Scotland in each of the following Years.

Years.	Coals, great.		Coals, small, Newcastle Measure.		Coals, small, Winchester Measure.		Total Shipments in Tons.	
	Tons.	Cwts.	Chds.	Bshs.	Chds.	Bshs.	Tons.	Cwts.
1790	32,760	16	429	6½	32,226	8	74,925	6
1791	35,621	15	526	54½	35,670	23	82,446	10
1792	29,569	8	524	12½	31,464	9	71,073	3
1793	19,515	2	240	41½	37,054	34	67,896	17
1794	24,856	15	417	7½	28,020	4	61,687	3
1795	19,147	18	423	59½	28,035	7	56,014	3
1796	31,649	9	762	51	29,978	4	71,891	9
1797	18,835	1	476	33	25,607	3	52,745	8
1798	24,858	4	471	64½	25,738	5	58,923	14
1799	10,943	19	774	38½	30,614	24	52,029	4

Note—The Ports from which the above were shipped:—
Ayr, Alloa, Bowness, Dundee, Irvine, Kirkaldy, Leith, Montrose, Port Glasgow, Glasgow, and Greenock.

Report on the Coal Trade. Reports Committee 26, 1800, p. 163.

Appendix, No. 12.

An Account of the Quantities of Coals exported from Scotland to Foreign Parts in each of the following Years, ending 5th January.

Years.	Tons.	Cwts.	Chds.	Total Exports. Tons.	Cwts.
1790–1791	33,042	15	290	33,416	15
1791–1792	36,314	2	283	36,679	2
1792–1793	29,421	17	260	29,752	17
1793–1794	19,750	12	245	20,062	12
1794–1795	25,879	14	489	30,502	14
1795–1796	19,775	15	257	20,107	15
1796–1797	30,847	4	240	31,115	4
1797–1798	19,392	9	31	19,431	3
1798–1799	24,709	3	110	24,849	3
1799–1800	11,423	9	326	11,838	9

Ports exporting:—
Alloa, Anstruther, Bowness, Dunbar, Kirkaldy, Leith, and Preston Pans.

Accounts and Papers, Vol. XVII., 1821, p. 79.

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APPENDIX, No. 13.

COALS exported from WALES in each of the following Years to Foreign Countries.

Years.	Cardiff.			Llanelly.			Pembroke			Total Exports in Tons.
	Newcastle Measure.	Winchester Measure.	Total in Tons.	Newcastle Measure.	Winchester Measure.	Total in Tons.	Newcastle Measure.	Winchester Measure.	Total in Tons.	
	Chds. Bshs.	Chds. Bshs.		Chds. Bshs.	Chds. Bshs.		Chds. Bshs.	Chds. Bshs.		
1790	..	..	..	471 6	661 26	2,190	55 0	1,029 9	1,508	3,704
1791	..	..	..	612 59	342 0	2,219	..	386 9	481	2,700
1792	..	..	..	420 30	56 0	1,251	1 30	387 0	514	1,765
1793	..	..	..	68 8	979 25	1,478	105 15	464 0	786	2,264
1794	..	..	..	..	255 0	339	124 44	557 18	765	1,104
1795	..	..	..	..	..	..	..	481 9	637	637
1796	..	3 12	4	113 0	..	300	..	355 0	470	774
1797	..	952 18	1,262	57 0	..	150	..	254 18	338	1,750
1798	..	303 22	402	..	883 0	1,040	..	305 0	404	1,846
1799	..	274 0	313	..	631 18	837	..	125 0	165	1,315

APPENDIX, No. 14.

An ACCOUNT of the COALS exported from SWANSEA in each of the following Years.

Years.	To London.		To all other Places.			Shipments to Foreign Countries.		Total Shipment in Tons.	Total Shipment Coast-wise in Tons.	Total Shipment Foreign in Tons.
	Coals.	Stone Coal.	Coals.	Stone Coal.	Culm.					
	Winchester Chds. Bshs.	Tons.	Winchester Chds. Bshs.	Tons. Cwts.	Winchester Chds. Bshs.	Newcastle Chds. Bshs.	Winchester Chds. Bshs.		Tons.	Tons.
1760	..	..	49,124 4	86 0	1,399 0	..	..	64,502	..	..
1761	..	..	40,661 7	187 0	1,375 0	..	..	53,772	..	..
1762	..	..	54,438 19	178 0	1,577 0	..	..	71,597	..	..
1763	8 0	..	53,612 5	349 0	1,616 0	..	..	70,725	..	..
1764	..	..	72,872 14	323 0	1,581 0	..	..	102,391	..	..
1765	..	..	67,500 20	206 0	1,845 0	..	..	88,624	..	..
1766	155 12	..	68,864 11	59 0	2,030 0	..	..	90,645	..	..
1767	..	..	72,828 6	222 0	3,948 0	..	..	98,111	..	..
1768	..	..	76,901 19	161 0	2,511 27	..	..	101,412	..	..
1769	..	..	84,996 5	254 0	2,259 18	..	..	113,509	..	..
1770	1,617 27	..	92,758 6	205 5	4,513 9	1,383 8	20,073 34	157,588	126,288	29,238
1771	950 19	..	92,195 32	269 0	2,692 0	1,574 54	22,591 25	154,943	121,409	32,828
1772	1,479 27	..	108,787 33	406 15	2,484 27	1,647 20	24,068 30	179,595	142,214	35,494
1773	..	36	135,250 4	1,350 10	2,902 16	525 32	30,972 5	218,060	177,294	40,730
1774	..	..	104,421 5	425 0	2,483 18	752 6	24,534 17	169,999	136,627	33,372
1775	..	145	114,936 7	2,371 10	3,868 27	591 59	21,459 30	182,746	154,242	28,504
1776	90 0	..	109,329 2	3,781 0	4,607 0	1,351 4	22,370 34	181,239	149,139	32,100
1777	..	561	123,869 4	5,518 4	6,453 4	243 42	23,338 31	202,023	171,041	30,401
1778	..	727	126,266 1	7,885 15	9,961 27	470 4	21,669 17	211,172	181,573	28,873
1779	6 0	..	139,486 11	13,319 17	19,253 20	186 11	25,676 11	244,976	211,748	33,228
Total	4,307 13	1,469	1,786,548 29	38,056 4	74,176 18	8,725 24	236,756 18	2,757,629	1,571,575	324,767

Report on Coal Trade, Reports Committee, Vol. XXVI., 1800, p. 186.
Reports of Committees, House of Commons Library.

APPENDIX, No. 15.

EPITOME of the COAL TRADE in the PORT of LONDON from the 1st January 1775 to the 1st January 1800, by THOMAS GILLESPY.

YEARS.	War.	Peace.	Coal delivered in London in Chaldrons.	The same converted into Statute Tons.	Rate of Duty paid.	Periods of Years.	Average of Chaldrons of 25½ cwts.	Increase, Chaldrons of 25½ cwts.	Decrease, Chaldrons of 25½ cwts.
					s. d.				
1775	War	..	664,278½	846,955	8 0	..	..	..	..
1776	Do.	..	700,617	893,286	Do.	..	..	..	..
1777	Do.	..	699,108	891,363	Do.	1775 to 1779	660,284 19/20	..	..
1778	Do.	..	645,007	822,384	Do.	1776 to 1780	661,438 4/5	1,153 1/5	..
1779	Do.	..	592,413½	755,327	8 4½	1777 to 1781	649,895 1/2	..	11,542 4/5
1780	Do.	..	670,038	854,298	Do.	1778 to 1782	649,457 1/4	..	438 1/4
1781	Do.	..	642,914½	819,715	Do.	1779 to 1783	662,856 1/2	13,399 1/2	..
1782	Do.	..	696,913½	888,564	8 9½	1780 to 1784	687,728	25,341 1/2	..
1783	Do.	..	709,554½	904,809	Do.	1781 to 1785	700,685 1/2	12,957 1/2	..
1784	..	Peace	719,120	916,878	Do.	1782 to 1786	719,817 1/2	19,131 1/2	..
1785	..	Do.	734,286½	936,215	Do.	1783 to 1787	731,002 1/2	11,185 1/2	..
1786	..	Do.	738,572½	941,680	Do.	1784 to 1788	741,132 1/2	10,129 1/2	..
1787	..	Do.	752,840½	959,871	8 10	1785 to 1789	756,284 1/2	15,152 1/2	..
1788	..	Do.	760,301½	969,384	Do.	1786 to 1790	758,893 1/2	2,608 1/2	..
1789	..	Do.	795,422½	1,014,164	Do.	1787 to 1791	776,177 1/2	17,283 1/2	..
1790	..	Do.	747,330	952,846	Do.	1788 to 1792	793,884 1/2	17,707 1/2	..
1791	..	Do.	824,990½	1,051,868	Do.	1789 to 1793	807,926 1/2	8,041 1/2	..
1792	..	Do.	841,380	1,072,759	Do.	1790 to 1794	800,591 1/2	..	1,335 1/2
1793	War	..	800,510½	1,020,651	Do.	1791 to 1795	828,676 1/2	28,085 1/2	..
1794	Do.	..	788,744½	1,005,649	Do.	1792 to 1796	827,546 1/2	..	1,130 1/2
1795	Do.	..	887,759	1,131,893	Do.	1793 to 1797	832,170 1/2	4,623 1/2	..
1796	Do.	..	819,339½	1,044,658	Do.	1794 to 1798	829,308 1/2	..	2,862 1/2
1797	Do.	..	864,497½	1,102,235	Do.	1795 to 1799	843,977 1/2	14,668 1/2	..
1798	Do.	..	786,300½	1,002,405	9 3/15	1796 to 1800	867,405 1/2	23,518 1/2	..
1799	Do.	..	862,085½	1,099,162	Do.	1797 to 1801	875,575	1,079 1/2	..
1800	Do.	..	1,005,352½	1,281,824	Do.	..	..	..	..

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APPENDIX, No. 16.

AMOUNT of the DUTIES which have been annually received on COALS imported into the PORT of LONDON.*

In the Years ending	Annual Produce of the Duty of 10*d.* per Chaldron on Coals imported into the Port of London.
	£ s. d.
5th July 1768	24,039 17 7
„ 1769	27,932 13 8
„ 1770	26,852 10 10
„ 1771	26,137 14 10
„ 1772	29,641 15 3
„ 1773	27,461 17 4
„ 1774	26,109 13 3
„ 1775	26,671 0 1
„ 1776	29,311 12 1
„ 1777	28,882 19 4
„ 1778	27,860 13 6
„ 1779	26,639 0 5
„ 1780	25,998 0 1
„ 1781	26,927 17 11
„ 1782	25,935 8 1
„ 1783	28,746 11 0
„ 1784	30,519 17 1
„ 1785	29,660 9 4
„ 1786	31,791 0 0
„ 1787	30,758 7 8
„ 1788	32,728 17 3
„ 1789	30,719 0 11
„ 1790	33,100 0 1
„ 1791	33,066 9 0
„ 1792	35,538 5 8
„ 1793	33,881 11 0
„ 1794	34,285 8 8
„ 1795	34,595 3 9
„ 1796	35,539 0 7
„ 1797	34,491 12 11
„ 1798	35,652 18 5
„ 1799	34,951 19 6

* Extract from Report from Select Committee on the Coal Trade Port of London) Bill, June 13th, 1838. (Page 261.)

APPENDIX, No. 17.

SUMMER and WINTER PRICES of COAL in 1785, giving the lowest PRICES that COALS can be sold at the different MARKEES in ENGLAND to make a reasonable PROFIT.*

Summer Prices—from 1st April to 1st October.
Winter Prices—from 1st October to 1st April.

	Chaldron.	
	Summer.	Winter.
	s. d.	s. d.
Whitby, Scarborough, and Filay	34 0	35 0
Bridlington, Hornsey, and Holderness Coast	28 0	29 0
Lincolnshire Main	15 6	16 6
Boston Town	21 0	22 0
Boston, Scalp, and Spalding	20 0	21 0
Wisbeach at the Old Eye	20 6	21 6
Ditto at the Point	21 6	21 6
Ditto at the Town	23 0	24 0
Burnham, Wells, Blakeney, and Norfolk Main	24 6	25 6
Oxford and Aldborough	26 6	24 0
South Wold	24 6	26 0
Woodbridge	22 6	24 0
Ipswich	23 6	25 0
Manningtree, Harwich Town, Walton-upon-Naze, and Hanfleet Water	22 6	24 0
St. Olyth, Bradley Creek, Wevenhoe, Colchester, and Fowlsbury	23 0	24 6
Maldon	23 0	24 6
Burnham, Southend, Lea, Hole-haven, Mucking, Tilbury, Rochester, Chatham afloat, Chatham ashore, Queensborough, Sheerness, Milton, and Faversham	23 6	25 0
Winstable and Hearn Beach	23 6	25 0
Margate, Broadstairs, and Ramsgate	24 0	25 6
Sandwich	24 0	25 6
Deal Beach	25 0	26 6
Dover	37 0	39 0
Folkestone	29 0	31 0
Romney, Lyd, and Hide Beach	39 0	41 9
Rye	24 6	26 6
Hastings, Pevensey, Bone	25 6	27 6
Newhaven and Shoreham	26 0	28 0
Brighthelmstone	27 0	29 0
Littlehampton, Arundel, and Selsy	26 0	28 0
Chichester and Itchnor	25 0	27 0
Ditto at Dell Key	26 0	28 0
Emsworth and Langston	25 0	27 0
Portsmouth afloat, Ditto ashore, Farnham, Gosport, Hamble, Northam, Southampton Key, Ealing, Red Bridge, Limington, and Badley Creek	25 0	27 0
Pool	26 0	28 0
Newtown, Cowes, and St. Helen's	25 0	26 6
Weymouth per Bushel	1 6	1 8
Bridport and Lime Cob „	1 8	1 10
Topsham per Quarter	12 0	13 0
Teignmouth and Brixham „	12 6	13 6
Dartmouth „	12 0	13 0
Salcomb „	12 6	13 6
Plymouth, Falmouth, Fowey, in quantities „	13 0	14 0
Ditto, retail „	14 0	15 0

† Collieries and Coal Trade.—*Bell's Selection*, Mining Record Office. vol. 2 1785.

APPENDIX, No. 18.

QUANTITIES of COAL exported from WHITEHAVEN.

Years.	Chaldrons =	to Waggons =	to Tons.
1781	69,500	55,600	119,540
1782	71,740	57,392	123,393
1783	76,420	61,136	131,442
1784	74,600	59,680	128,312
1785	90,860	72,688	156,279
1786	80,280	64,224	138,082
1787	92,257	73,805	109,181
1788	98,828	90,062	193,633
1789	94,542	75,633	162,611
1790	84,011	67,208	144,947
1791	68,313	54,605	117,401
1792	69,966	55,972	125,340

One chaldron and a quarter is equal to one waggon Newcastle chaldron. A waggon is 72 Winchester bushels, streaked measure, A waggon weighs about 42 to 44 cwt. Duty to Ireland, 3*s.* 2*d.* per chaldron; to foreign dominions 5*s.*

ACCOUNTS of RECEIPTS and PAYMENTS at the Custom House, Whitehaven, from 17th June 1794 to 5th Jan. 1795.

	£ s. d.
Duties received	19,832 17 8½
Salaries and incidents paid	1,231 5 1
Debentures on goods exported	185 14 10½
Bounties on ditto	894 7 5
Certificates of over entries	35 16 11
Net	18,485 13 5½

APPENDIX, No. 19.

QUANTITY of COAL EXPORTED from WORKINGTON, MARYPORT, and HARRINGTON.*

Years.	Chaldrons =	to Waggons =	to Tons.
1781	68,960	55,128	118,525
1782	68,700	54,960	118,164
1783	72,980	58,384	125,526
1784	79,640	63,412	136,336
1785	88,220	70,576	151,738
1786	82,920	66,336	142,622
1787	95,808	76,664	164,828
1788	94,354	75,483	162,228
1789	93,051	74,440	160,046
1790	92,931	74,344	159,819
1791	104,455	83,556	179,645
1792	98,426	78,740	169,291

* History and Antiquities of Cumberland, by Wm. Hutchinson, Carlisle, 1794.

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Appendix, No. 20.

A List of Collieries in Derbyshire and the immediately adjoining Counties, in 1811, giving the names only of such Collieries as do not occur in the list following this one by Stephen Glover for 1831.*

[General view of the Agriculture and Minerals of Derbyshire, by John Farey, senior, London, 1811.]

1. Abdy, 1¼ m. S. of Wath, in Yorkshire.
2. Adlington, S. of Lyme Park, 2¼ m. S.S.W. of Disley, in Cheshire, 3rd coal.
3. Alton-grange, S.E. of Ashby-de-la-Zouch, in Leicestershire (formerly).
4. Armitage (or Mouse-hole Forge), E. of Stannington, near Sheffield, Yorkshire, 2nd coal.
5. Ashby Wolds, Leicestershire, see Littleworth, Milkhill, Norrshill, Sweethill, Warrenhill.
6. Aspley near Bobber's Mill, in Wollaton, Nottinghamshire, under yellow lime.
7. Aston Common, S.W. of the Town, in Yorkshire (formerly).
8. Attercliff Bridge, see Washford.
9. Attercliff Common, E. of the Town, in Yorkshire, 12th coal (lately).
10. Awsworth, ½ m. E. of the Town, in Nottinghamshire (lately).
11. Bakestonedale, N.E. of Port Shrigley, Cheshire, 2nd coal, brasses.
12. Ballyfield, E. of Hansworth, in Yorkshire, 12th coal.
13. Bankend, N.E. of Disley, in Cheshire, 1st coal.
14. Banner Cross, see Greystone.
15. Beauvale Abbey, N. of Gresley, Nottinghamshire (formerly).
16. Bee Low, ¾ m. E. of Oakmoor Mills, near Alveton, in Staffordshire, 1st coal (formerly).
17. Beggarlee, 1 m. N.E. of Eastwood, in Nottinghamshire.
18. Benersley Green, near Thursfield, Staffordshire, upper coals.
19. Benersley, see Ilkestone Common.
20. Berristow, ½ m. S.E. of Pott Shrigley, in Cheshire, 3rd coal (formerly).
21. Biggin, ½ m. W. of Axton, in Yorkshire (formerly).
22. Biddulph Hall, N. of the Town, in Staffordshire, upper coals.
23. Bilborough, N. of the Town, in Nottinghamshire, under yellow lime (formerly, now Holly wood).
24. Buchen-booth, 1¼ m. W. of Flash, in Staffordshire, 2nd coal (lately).
25. Blackburn-bank, W. of Kimberworth, in Yorkshire, 9th coal.
26. Blackfordby, S. of the Village, near Ashby-de-la-Zouch, Leicestershire (formerly).
27. Blakelow, S.E. of Macclesfield, Cheshire, 2nd coal (lately).
28. Blue-hills, N. of Bramcote, 3 m. S.S.W. of Flash, in Staffordshire, 2nd coal.
29. Bollington, N.N.E. of Macclesfield, in Cheshire.
30. Bow-green, E. of Norton, near Bagnall, in Staffordshire, upper coals.
31. Brabins, N. of Marple Chapel, in Cheshire, 2nd coal.
32. Bradgate, N. of the Village, ⅛ m. N.E. of Kimberworth, Yorkshire, 10th coal.
33. Bramcote, ¾ m. N.E. of Stapleford, Notts (lately).
34. Bucks, W. of Wickersley, Yorkshire.
35. Bright-side, N. of Attercliff, Yorkshire (formerly).
36. Brinsley (or Brunsley), New or Fentons, N. of the village, 1¾ m. N. of Eastwood, in Nottinghamshire.
37. Brinsley (ditto), Old, E. of the village, 1 m. N. of Eastwood, in Notts.
38. Broomsteer, in Lancashire, 1½ m. N.W. of Hyde Chapel, Cheshire.
39. Brown-hills, 1½ m. N.E. of Pelsall, Staffordshire.
40. Brunton, S.E. of Rugeley, Staffordshire, cannel.
41. Bull-house, 2 m. W.S.W. of Penistone, 2nd coal.
42. Car-lane, 1 m. N.E. of Ashton-under-Line, Lancashire, Peacock coal.
43. Carsteven, see Lawn.
44. Carwood, N.E. of Oakmoor Mills, in Staffordshire, 1st coals (formerly).
45. Castedge, S.E. of Jenkin Chapel, 3 m. S. of Taxhall, in Cheshire, 1st coal.
46. Catcliff, ¾ m. N.W. of Treton, Yorkshire.
47. Chapel-house, N.E. of Marple Chapel, in Cheshire, 2nd coal.
48. Chapel Town, S.E. of Mortomley, near Tankersley, Yorkshire (an iron furnace and mines).
49. Chest (near Flash), 3 m. E. of Wincle Chapel, in Cheshire, 2nd coal (formerly).
50. Cliffbank (or Cliff), E. of Macclesfield, in Cheshire, 2nd coal.
51. Clough, ¾ m. N.W. of Rotherham, Yorkshire.
52. Clough-head, ¾ m. W. of Foxton (or Fox't), in Staffordshire, 2nd coal.
53. Cole Orton, E. of the town, Leicestershire.
54. Conduit-moor, ½ m. E. of Aston, in Yorkshire (formerly).
55. Conisborough, E. of the town, Yorkshire, under yellow lime (formerly).
56. Cortworth, 1¼ m. E. of Wentworth Chapel, Yorkshire.
57. Cossall, ½ m. N.W. of the town, in Nottinghamshire (lately).
58. Crabtree, ⅛ m. N. of Biddulph, Staffordshire, upper coals.
59. Crickety, ⅛ m. N.E. of Ashton-under-Line, in Lancashire.
60. Crooks-croft, see Ponds.
61. Crooks-moor, 1⅛ m. W. of Sheffield, in Yorkshire, 3rd coal, crowstone.
62. Crowden-clough, 1½ m. N.W. of Woodhead, in Cheshire, 1st coal (open work).
63. Crow-gutter, ¾ m. E. of Ipstone, in Staffordshire, 1st coal.
64. Crown-point, 1 m. S.W. of Cheddleton, in Staffordshire, 2nd coal.
65. Cunsal Wood, 2⅛ m. S.S.E. of Cheddleton, in Staffordshire, 1st coal.
66. Danehead, Cheshire, 2 m. N.W. of Flash, in Staffordshire, 2nd coal.
67. Danethinn, Cheshire, ⅛ m. W. of the last, 2nd coal.
68. Darnall, ¾ m. E. of Attercliff town, in Yorkshire, 12th coal.
69. Deep-car, 1½ m. S.W. of Wortley Chapel, Yorkshire, 2nd coal.
70. Deep-pits (or Wood), 1¾ m. S.E. of Sheffield, in Yorkshire, 8th coal.
71. Delph-house, 1 m. W. of Cheadle, in Staffordshire, 2nd coal.
72. Dennaby, S.E. of the village, near Conisborough, in Yorkshire, under yellow lime,
73. Denton, in Lancashire, 1½ m. W.N.W. of Hyde Chapel, in Cheshire,
74. Diamond Hill, 1¼ m. W.N.W. of Flash, in Staffordshire, 2nd coal
75. Diglee (or Whaley Moor), 2 m. S.E. of Disley, in Cheshire, 2nd coal.
76. Dilhorn, ¾ m. N.N.E. of the town, near Cheadle, in Staffordshire, 2nd coal.
77. Dirty Hucknal (near Blackwell), 2¼ m. S.W. of Skegby, in Nottinghamshire.
78. Duckingfield, N.W. of the Chapel, in Cheshire.

* A similar list was published in Tillock's Philosophical and Geological Magazine, vol. 35.

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79. Dungworth, 1½ m. N.W. of Stannington, Yorkshire, 2nd coal.
80. Dunkirk, 1¼ m. S. of Duckingfield, Cheshire.
81. Dunshill (or Dunsell), 1 m. W. of Teversall, in Nottinghamshire (see p. 167).
82. Dunston, E. of the Village, 2 m. N.N.W. of Chesterfield, 10th coal, smithey coal.

83. Eastborough-lane, N.E. of Macclesfield, Cheshire, 3rd coal.
84. East-wall, 2 m. N.E. of Cheadle, in Staffordshire, 1st coal.
85. Eastwood, ½ m. N. of the town (formerly), ½ m. W. and N.W. in Notts.
86. Eaves, S. of Cheadle, in Staffordshire.
87. Egerton Wood, S.E. of Beaudesert Park, in Staffordshire.
88. Elsicar, N. of Wentworth Chapel, in Yorkshire (an iron furnace and mines).
89. Essington New Colliery, 3 m. W.S.W. of Pelsall, Staffordshire.
90. Essington Wood, 2½ m. W. of Pelsall, Staffordshire.

91. Fairbottom, 1¾ m. N. of Ashton-under-Line, in Lancashire.
92. Falls, in Biddulph, Staffordshire.
93. Flash-house, 2 m. W.N.W. of Penistone, in Yorkshire, 5th coal.
94. Flowery-field, ¾ m. S.S.E. of Duckingfield, Cheshire.
95. Fox Ears, ½ m. W. of Aston, in Yorkshire (formerly).
96. Foxtonwood, ½ m. W. of the town, near Froghall in Staffordshire, 1st coal.
97. Froghall, ¼ m. S.E. of the wharf, in Kingsley, Staffordshire, 1st coal (formerly).
98. Fullshaw, 2¼ m. S.W. of Penistone, in Yorkshire, 2nd coal, crowstone.
99. Furnace-clough, N. of Whaley Bridge, 1¾ m. E. of Disley, in Cheshire, 2nd coal,

100. Gap-sitch, ½ m. W.N.W of Taxhall in Cheshire, 1st coal (formerly).
101. Garstone, ⅓ m. E. of the Whiston Copper Works in Kingsley, Staffordshire, 2nd coal (lately).
102. Gee, 1¼ m. S.W. of Disley, in Cheshire (lately).
103. Gober-hall, near Barnsley, Yorkshire.
104. Gold-sitch, 1½ m. S.W. of Flash, in Staffordshire, 2nd coal.
105. Goscot, ¾ m. S.W. of Pelsall, in Staffordshire (an iron forge, &c).
106. Grass-moor (Platt's), 1 m. W. of Temple Normanton, 11th coal.
107. Green-hills, N.W. of Midgley Gate, 2 m E. of Wincle Chapel, Cheshire, 1st coal.
108. Greenway, see Throstle's Nest.
109. Greasley, S. of the Church in Nottinghamshire, part under yellow lime, a fault across the works.
110. Greystones (or Banner's Cross), ¼ m. N.W. of Eccleshall Bierlow, in Sheffield, Yorkshire, 3rd coal.

111. Hag Bank, ⅜ m. N.N.E. of Disley, Cheshire, 1st coal, brasses (lately).
112. Hagenfield, 1¾ m. E.S.E. of Bradfield Chapel, Yorkshire, 1st coal (lately).
113. Hague Bank, ¾ m. E. of Mottram, in Cheshire, 2nd coal (formerly).
114. Hansworth, ½ m. N. of the town, in Yorkshire, 11th coal.
115. Hansworth-woodhouse, W. of the village near Hansworth, Yorkshire, 11th coal.
116. Harbour-thorn in Sheffield Park, S.E. of the town, in Yorkshire, 8th coal.
117. Harrop, S.W. of Brink, 1½ m. E. of Pott Shrigley, in Cheshire, 1st coal.
118. Hay-clough near Midgley Gate, 2 m. E. of Wincle Chapel, Cheshire, 1st coal (formerly).
119. Hay-House, ¾ m. S.W. of Ipstone, in Staffordshire, 1st coal (formerly.)
120. Hays, 1 m. N.E. of Ashton-under-Line, in Lancashire.
121. Haw-wood, ¾ m. S. of Greasborough, in Yorkshire.
122. Hazle-barrow, 2½ m. S.S.W. of Flash, in Staffordshire, 2nd coal.
123. Hazles-cross, 1 m. W. of Kingsley, in Staffordshire, 2nd coal.
124. Heasley-park, ¼ m. N.E. of Chapel-Town, in Yorkshire.
125. Heath-End, ⅓ m. W. of Stanton-Harold, in Leicestershire (formerly.)
126. Heather, S. of the town, in Leicestershire.
127. Heningthorpe, 1½ m. S.E. of Rotherham, in Yorkshire.
128. High-hazles, E. of Darnall, 1½ m. S.E. of Attercliff, in Yorkshire, 12th coal.
129. Hill-End, ¾ m. S.S.W. of Mottram, in Cheshire, 3rd coal.
130. Hill-top, W. of Kimberworth, 2½ m. W. of Rotherham, in Yorkshire, 9th coal (formerly).
131. Hodge-Hall, 1½ m. S. of Mottram, in Cheshire, 2nd coal.
132. Hodge-Hay, ½ m., S.E. of Whiston Copperworks, in Kingsley, Staffordshire, 2nd coal (lately).
133. Holes, near Strinds' Inn, 2½ m. S.W. of Bradfield Chapel, in Yorkshire, 1st coal (lately).
134. Hollings Moor, ¾ m. W. of Wickersley, in Yorkshire (formerly).
135. Hoober, near Cortworth, 2 m. E. of Wentworth Chapel, in Yorkshire.
136. Hoo-lane, W. of the houses, 2½ m. N.W. of Disley, in Cheshire (formerly).
137. Hough, *see* Nether and Over.
138. Hough-hill, 1¼ m. E.S.E. of Duckingfield, Cheshire, 3rd coal.
139. Hucknal, *see* Dirty Hucknal.
140. Hunshelf, 1½ m. W. of Wortley Chapel, in Yorkshire, 2nd coal (formerly).
141. Hurdsfield, N. of Macclesfield, Cheshire.
142. Hurst-brook, N.E. of Ashton-under-Lyne, in Lancashire.
143. Hyde-lane, 1¼ m. N.W. of Hyde Chapel, Cheshire.

144. Jack-elm, 1 m. S.E. of Whiston Copperworks, in Kingsley, 1st coal (formerly).

145. Intake (in Woodthorpe), 1½ m. S.W. of Handsworth, in Yorkshire, 10th coal.
146. Ipstone, ¼ m. S. of the Church, in Staffordshire, 1st coal (formerly).

147. Kerredge, east-side, ½ m. W. of Rainow Chapel, in Cheshire, 3rd coal.
148. Kerredge, north-end, 1 m. N.W. of Rainow Chapel, in Cheshire, 3rd coal.
149. Kimberworth, S. and N. of the village, 1½ m. from Rotherham, in Yorkshire, 10th coal (formerly).
150. Kimberworth-park, 1¾ m. N.W. of Rotherham, in Yorkshire, 10th coal.
151. King-bank, ¾ m. N. of Moseley, in Lancashire, 1st coal.
152. Kingsley-bank, ¾ m. N.N.W. of Kingsley, in Staffordshire, 1st coal.
153. Knipe, ⅝ m. S.W. of Ipstone Church, in Staffordshire, 1st coal.
154. Knoll (or Stone-pit shaft), 1 m. N.E. of Ashton-under-Line, in Lancashire.

155. Latche, N.W. of Cutthom Farm, 2¾ m. N.E. of Wincle Chapel, in Cheshire, 1st coal (formerly).
156. Law, in Kirk-Burton, 4½ m. W.N.W. of Penistone, in Yorkshire, 3rd coal.
157. Lawn (or Casteven or Kesteven), W. of Aston, in Yorkshire (formerly).

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158. Lees, round the village, 1¼ m. E.N.E. of Kingsley, in Staffordshire, 1st coal (formerly.)
159. Lime, *see* Lyme.
160. Limes, ½ m. S. of Greasley, in Nottinghamshire.
161. Little-worth, ½ m. S.W. of Boothorpe, on Ashby Wolds, in Leicestershire (formerly).
162. Lords-hay, 2 m. N.N.W. of Pelsall, in Staffordshire.
163. Lount, New (Sir G. Beaumont's), N. of Coleorton, Leicestershire.
164. Lount Old (Earl Ferrars'), N. of Coleorton, Leicestershire.
165. Low Ash, 1¾ m. N. of Stannington, in Yorkshire, 1st coal.
166. Low Wood, 1 m. N.E. of Wentworth Chapel, in Yorkshire.
167. Lyme, at S.W. corner of the Park, 2¼ m. S.W. of Disley, in Cheshire, 4th coal.
168. Lyme Park, ¾ m. S. of Disley, in Cheshire, 1st coal (formerly).

169. Macclesfield Common, 1 m. E.S.E. of the town, in Cheshire, 2nd coal.
170. Manour, 2 m. S.E. of Sheffield (formerly 1 m. E.S.E.), in Yorkshire, 10th coal.
171. Massborough Common, 1½ m. W. of Rotherham, in Yorkshire, 10th and 11th coals (formerly), iron furnace and mines.
172. Meadow Hall, in Kimberworth, N.W. of Rotherham, Yorkshire.
173. Mexborough, 1 m. N.W. of the town, in Yorkshire.
174. Midhope Stones, N.E. of the village, 2¼ m. S. of Penistone, in Yorkshire, 2nd coal.
175. Milk Hill, 1 m. N.W. of Boothorpe, on Ashby Wolds, in Leicestershire (lately), good fire clay.
176. Mill-house, S.E. of Eccleshall Bierlow Chapel, in Sheffield, Yorkshire, 3rd coal, fire clay, and crowstone.
177. Moberley, S.S.E. of Cheadle, in Staffordshire.
178. Moss, ⅜ m. W. of Ringing-low Bar, 2¾ m. W.S.W. of Eccleshall Bierlow, in Yorkshire, 2nd coal.
179. Mouse Hole, *see* Armitage.
180. Mouse Trap, W.N.W. of Spire Bent Farm, 3¾ m. N.E. of Wincle Chapel, in Cheshire, 1st coal (formerly).

181. Netherfield, ½ m. E.S.E. of Ipstone, in Staffordshire, 1st coal.
182. Nether Hough, E. of the village, 1 m. N.W. of Rawmarsh, in Yorkshire.
183. New Mills, *see* Tor Mine.
184. New Pool, in Biddulph, Staffordshire, upper coals.
185. New Post, ⅛ m. N. of Rainow Chapel, in Cheshire, 3rd coal.
186. Newstead, 1 m. S.S.W. of Cheddleton, in Staffordshire, 1st coal.
187. Newthorpe Common, 1 m. N.W. of Awsworth, in Nottinghamshire (formerly).
188. Newton Moor, 1 m. S.S.E. of Duckingfield, in Cheshire.
189. Norbury, S.W. of Hoo Lane, 2⅛ m. W.N.W. of Disley, in Cheshire, brasses.
190. Norris Hill, N. and N.E. of the house, 1 m. S.W. of Blackfordby, on Ashby Wolds, in Leicestershire (formerly).
191. North End, *see* Kerredge.
192. Notbury, W. of the houses, 1 m. N.W. of Flash, in Staffordshire, 1st coal (formerly).

193. Orgrave, ¾ m. N.E. of Hansworth, in Yorkshire (lately).
194. Over Hough, N.W. of the houses, 1 ¼ m. N.W. of Rawmarsh, in Yorkshire.
195. Packington ¼ m. S.W. of the town, in Leicestershire (formerly).
196. Park, 2 m. N.W. of Mossley, in Lancashire.
197. Park Furnace, ½ m. N.E. of Sheffield, in Yorkshire, 10th coal (formerly), an iron furnace.
198. Park Gate, 2 m. S. of Wentworth Chapel, 10th coal (formerly).
199. Parkins Wood, near Chapel Town, in Yorkshire.
200. Parsons Field (Wolf's), ¼ m. N. of Dilhorn, in Staffordshire, 2nd coal.
201. Paw Hill, 2¼ m. S.W. of Penistone, in Yorkshire, 2nd coal.
202. Pelsall, E. of the church, 2 m. N.E. of Bloxwick, in Staffordshire.
203. Penny Hole, 1¼ N.N.W. of Flash, in Staffordshire, 1st coal.
204. Pidgeon Bridge, ⅜ m. S.W. of Aston, in Yorkshire (formerly).
205. Polesworth, 4 m. E. of Tamworth, in Warwickshire.
206. Ponds (or Crooks Croft,) in Sheffield Town, E. of the Sheaf River, Yorkshire, 8th coal.
207. Pott Hall, ¼ m. N.E. of Pott Shigley, in Cheshire, 3rd coal (formerly).
208. Poynton, S.E. of the village, 2¼ m. W. of Disley, in Cheshire.

209. Quarnford, W. of the house, 2¼ m. E. of Wincle Chapel, in Cheshire, 1st coal (formerly).

210. Rabbit Hole, S. of Staley Bridge, 1¼ m. E.N.E. of Duckingfield, in Cheshire, 2nd coal.
211. Rake Edge, S. of Lees, 1¼ m. S.E. of Kingsley, in Staffordshire, 1st coal.
212. Rainow Low, ¼ m. N. of Rainow Chapel, in Cheshire, 3rd coal.
213. Rawmarsh, N.W. of the town, in Yorkshire.
214. Red Acre, near Lyme Park, 2⅛ m. S.W. of Disley, Cheshire, 4th coal.
215. Riley Clough, on Macclesfield Common, 1 m. E. of the town, Cheshire, 2nd coal, brasses.
216. Robinets, ⅜ m. E. of Cossall, in Nottinghamshire.
217. Robins-clough, N.E. of Midgley-gate, 2⅛ m. E. of Wincle Chapel, in Cheshire, 2nd coal (formerly).
218. Ross Bank, ⅜ m., S. of Lees, in Kingsley, Staffordshire, 1st coal.
219. Rotches, 1¼ m., W. of Mossley, in Lancashire.
220. Royds-moor, ½ m., S.E. of Whiston, in Yorkshire (formerly).

221. Sandy-gate, N.E. of Fullwood, 2⅛ m. W. of Sheffield, 1st coal (lately).
222. Score-wood, at the E. end of Duckingfield Town, in Cheshire, peacock coal.
223. Scout-mill, W., ⅜ m. S. of Mossley, in Lancashire, 1st coal (dug open formerly.)
224. Shafferlong, ⅜ m. S.S.W. of Cheddleton, in Staffordshire, 2nd coal.
225. Shaw (or Sham), 1 m. W. of Cheadle, in Staffordshire.
226. Shaw, 1¼ m. N.N.E. of Cheadle, in Kingsley, Staffordshire, 2nd coal.
227. Sheffield Park, see Deep Pits, Manor, Park, and Ponds.
228. Shilo, N.W. of Dirty Hucknal, 2 m. W.S.W. of Skegby, in Nottinghamshire.
229. Shingleyfold, N.E. of Macclesfield, in Cheshire, 3rd coal.
230. Silkstone (Parker's Furnace), in Yorkshire (formerly).
231. Skegby, 1 m., W. of the town, in Nottinghamshire, part under yellow lime.
232. Smelting, S.E. of Ringing-low-bar, 1¾ m. W.S.W. of Eccleshall Bierlow, in Yorkshire, 2nd coal, brasses.
233. Smithy Wood Engine, 1 m. E. of Chapel Town, in Yorkshire.

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234. Southwood, 2 m. N.N.E. of Ashby-de-la-Zouch, in Leicestershire (formerly).
235. Spons, N.E. of Brink, 1½ m., E. of Pott Shrigley, in Cheshire, 1st coal (formerly).
236. Spons Moor, near Lyme Park, 1¼ m. N.E. of Pott Shrigley, in Cheshire, 2nd coal, crowstone.
237. Stainborough Park, 2 m. W. of Worsborough, in Yorkshire.
238. Stanage, 1 m. W.N.W. of Stanage Pole, 4½ m. W. of Fullwood Chapel, in Yorkshire, 1st coal.
239. Stanton Harold, S.E. of the church, in Leicestershire.
240. Stillshutt, ½ m., S.W. of Foxton, near Ipstone, in Staffordshire, 1st coal.
241. Stockbridge, 1½ m. N. of Bolterstone Chapel, in Yorkshire, 2nd coal.
242. Storrs, 1½ m. N. W. of Stannington, in Yorkshire, 2nd coal.
243. Stubbing Lane, 1½ m. N.W. of Rawmarsh, in Yorkshire.
244. Styperson, N.W. of Pott Shrigley, in Cheshire.
245. Sudale, see Sudbrook.
246. Swallow Nest, 1 m. S.W. of Aston, in Yorkshire, 12th coal.
247. Swallow Wood Nook, 1½ m. S.E. of Wentworth Chapel, in Yorkshire.
248. Swanco, 2 m. N.E. of Macclesfield, in Cheshire, 3rd coal.
249. Sweet Hill Oak, ¾ m. S.S.E. of Boothorpe, on Ashby Wolds, Leicestershire (lately).
250. Swepston, E. and N.W. of the town, in Leicestershire (formerly).
251. Swetley (Lowe's), ¾ m. N.N.E. of Dilhow, in Staffordshire.
252. Tankersley Park, S. of the town, in Yorkshire.
253. Thorncliff, N. of Chapel Town, in Yorkshire, an iron furnace and mines.
254. Throstle's Nest (or Greenway), 2 m. E. of Macclesfield, in Cheshire, 2nd coal.
255. Tinsley Park, 1½ m. E. of Attercliff, in Yorkshire, (formerly).
256. Todwick Moor, ½ m. N.W. of the church, in Yorkshire (formerly).
257. Trap Lane, ½ m. N.W. of Eccleshall Bierlow Chapel, in Sheffield, Yorkshire, 3rd coal.
258. Trowel Moor, 1 m. W. of Wollaton, in Nottinghamshire.
259. Wadsley, W. of the village, 1½ m., N.N.E. of Stannington, in Yorkshire, 2nd coal, crowstone.
260. Wales, ½ m. S.S.E. of the town, in Yorkshire, over the Chesterfield canal tunnel (formerly).
261. Walton, N.N.E. of the Hall, 1½ m. S.W. of Chesterfield, 8th coal, and S.W. of the Hall.
262. Warps Moor, S.S.W. of New Mills, 1¾ m. E.N.E. of Disley, in Cheshire, 2nd coal (formerly).
263. Warren Hill Furnace (or Ashby Wolds), 1 m. W.N.W. of Over Seal, in Leicestershire, an iron furnace and mines, the deepest pits and thickest coal in all this list 202 yards deep and 21 feet thick.
264. Washford (or Attercliff Bridge) at S.W. end of Attercliff, near Sheffield, in Yorkshire, 11th coal.
265. Wath Wood, ¾ m. S. of Wath-upon-Dearn, in Yorkshire.
266. Waverton (or Warton), 5 m. E. of Tamworth, in Warwickshire.
267. Wentworth Park, S. of the pillar, 2½ m. S. of Wentworth Chapel, in Yorkshire (formerly).
268. Werneth Low, 1½ m., S. of Hyde Chapel, in Cheshire 2nd coal (formerly).
269. Westwood, E. of Wortley Chapel, in Yorkshire.
270. Wetly Moor (or Handley Ease), 2¾ m., S.W. of Cheddleton, in Staffordshire.
271. Whaley Moor, see Diglee.
272. Whiteshaw, 2½ m. S.S.W. of Flash, in Staffordshire, 2nd coal.
273. Whitfield, 1 m. N.E. of Norton, in Staffordshire, upper coals.
274. Whitley Wood, ¾ m. W. of Eccleshall Bierlow, in Sheffield, Yorkshire, 3rd coal, Periwinkles in Pyrites.
275. Wilnecote, S.E. of Tamworth, in Warwickshire.
276. Windy Bank, ½ m. W. of Mossley, in Lancashire, 2nd coal.
277. Wollaton, 1½ m. W.N.W. of the town, in Nottinghamshire, part under yellow lime.
278. Woodhall Moor, S. of the village, 1 m. S.W. of Harthill, in Yorkshire (formerly).
279. Woodhead (Mr. Lee's), ¾ m. N.E. of Cheadle, in Staffordshire.
280. Woodley, 1¼ m. S.W. of Hyde Chapel, in Cheshire.
281. Woodthorpe, S.E. of the houses, 1½ m. S.W. of Hansworth, in Yorkshire, 10th coal.
281. Worsborough, ¾ m. N.N.E. of the town, in Yorkshire.
282. Worth, 2¾ m. W.S.W. of Disley, in Cheshire.
283. Wyrley Bank, 2¾ m. N.W. of Pelsall, in Staffordshire.

APPENDIX, No. 21.

A LIST of COLLIERIES in DERBYSHIRE and immediately adjoining Counties, as given by STEPHEN GLOVER. 1831.

[The History and Gazetteer of the County of Derby. Published by Stephen Glover, edited by Thomas Noble. Derby. 1831.]

1. Adelphi (or Duckmanton) furnace, E. of Calow, near Long Duckmanton, 12th coal (an iron furnace and mines).
2. Alducar (Oulu-car) near Langley mill in Heanor (formerly).
3. Alderwasley, N.W. of the village, 1½ m. E. of Wirksworth, 1st coal.
4. Alfreton, S. and S.W. of the town (formerly).
5. Alfreton furnace, see Somercotes.
6. Alton, S. of the village, 1½ m., E.N.E. of Ashover, 3rd coal, crowstone, brasses.
7. Ankerbold, near Tupton, ¾ m. N.W. of North Wingfield, 9th coal (formerly).
8. Arbor-lands, 1 m. S.S.W. of Ecklington, 9th coal (formerly).
9. Apperknowl common, E. of Dronfield, 9th coal (lately).
10. Ash-gate in Brampton, 2 m. W. of Chesterfield, 7th coal (formerly).
11. Aspinshaw, W. of Hayfield in Glossop, 2nd coal.
12. Bank, S.E. of the village, 1¼ m. S.W. of Holmsfield, 5th coal (formerly).
13. Barlborough Common, W. of the town (formerly).
14. Barlow Common, ¼ m. W. of the town, 8th coal (formerly).
15. Baslow, 1¾ m. E. of the town, 2nd coal, brasses.
16. Beelly Moor, at S. end of Chatsworth Old Park, 1 m. N.E. of Beeley, 1st coal (formerly) crowstone.
17. Beighton-field, E.S.E. of Barlborough (formerly).
18. Belper-gutter, ½ m. E. of Belper, 2nd coal (formerly).
19. Belper Lane-end, 1 m. N.W. of Belper, 1st coal, brasses.
20. Belper Town, N.W. of the Church, 1st coal (formerly).
21. Bent, near White Moor, 1 m. N.E. of Belper, 2nd coal (formerly).
22. Benty-field, ¾ m. E. of Codnor, smithy coal.

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23. Beeley Moor, N. of the village, 2¾ m. W. of Beighton, 10th coal.
24. Berristord Moor, W. of Tupton (near Wingerworth furnace), ½ m. N.W. of North Winfield, 9th coal (formerly).
25. Berristow, 1 m. E.N.E. of South Normanton (lately).
26. Biggin, 1 m. N.N.E. of Tibshelf (formerly).
27. Birthin-lane 2½ m., N.E. of Ashover, 3rd coal, fire-clay, crowstone (lately).
28. Black-clough (or Beat), ½ m. N.W. of Flash, in Hartington Parish, 1st and 2nd coals, a great fault across the works, worked lately by a tunnel for boats.
29. Blackwell, one-third of a mile N.E. of the town.
30. Bole Hill, S.E. of the houses, 1¼ m. S.W. of Eckington, 8th coal (formerly).
31. Bore Lane, S. of Chisworth, 1¾ m. N.N.E. of Mellor, in Glossop, 2nd coal.
32. Boythorp, ¾ m. S. of Chesterfield, 9th coal.
33. Bramley Moor, 2¼ m. W. of Eckington, 8th coal.
34. Brampton, see Little Common.
35. Bretby (Bradby), ¾ m. N.W. of New Hall.
36. Brians-coppy, 1¼ m. S.S.W. of Calke (formerly).
37. Brimington, ½ m. W.S.W. of the town, 8th coal.
38. Brimington Moor, 1 m. S. of the town, 6th coal.
39. Broadhurst-edge, 1½ m. S.E. of Mellor, in Glossop, 3rd coal, crowstone.
40. Bugsworth, N.W. of Chapel-en-le-Frith, in Glossop, 2nd coal.
41. Burn'd-edge, in Ollerset, S.W. of Hayfield, 2nd coal.
42. Butterley (Car) one third of a mile N.E. of Ripley (an iron furnace and mines) worked formerly by a tunnel for boats.
43. Butterley Park, 1 m. N.E. of Ripley (over the Cromford Canal tunnel).

44. Calow, W. of the village, 2 m. E. of Chesterfield, 8th and 9th coals (formerly). E.N.E. the 11th coal now getting.
45. Carter-lane, 1 m. N. of Pinxton Church (lately).
46. Castle Hill, 1 m. N. of Pentrich, 10th coal.
47. Chatsworth Old Park, 1½ S.E. of Baslow, 2nd coal (formerly).
48. Chesterfield Furnaces, ½ m. W.S.W. of the town 9th coal (formerly), an iron furnace and mines.
49. Chesterfield town's-end, N.W. 9th coal (formerly), now further N.W.
50. Chevin-side, ¾ m. S.W. of Belper, 1st coal (formerly).
51. Clay-Cross, 1½ m. S.W. of North Wingfield, 9th coal (formerly).
52. Clown, ½ m. W. of the town.
53. Coal Aston, 1 m. N.E. of Dronfield, 8th coal.
54. Codnor, Nether Park, 1½ m. N.E. of Codnor.
55. Codnor, Upper Park, 1½ m. N.N.E. of Codnor.
56. Coldwell (or Cawdle), W. of Renishaw Hall, ½ m. S. of Eckington, 10th coal (formerly).
57. Combes Moss, 2 m. N. of Buxton, 1st coal (formerly).
58. Combs, S.E. of Charlesworth, 2½ m. S.W. of Glossop, 2nd coal.
59. Compstal Bridge, 1½ m. N.W. of Mellor, in Glossop, 2nd coal.
60. Cotmanhay Wood, 2m. N. of Ilkeston.
61. Cowpasture, near Beard, in Glossop, 2¾ m. N.W. of Chapel-en-le-Frith, 2nd coal.
62. Cutthorpe, ¾ m. S. of Barlow, 8th coal (formerly).

63. Dale Abbey, N.E. of the chapel (formerly, with iron furnace and mines).
64. Dally Gutter, ¾ m. N.W. of Belper, 1st coal, brasses.
65. Denby, N.E. of the church (formerly) 147 yards deep.
66. Denby-Hall, 1½ m. N. of Denby Church.
67. Dimmings Dale, ¾ m. E. of Blackwell (formerly).
68. Donisthorpe, N.E. of the village, 1½ m. N.W. of Measham, pits, 155½ yards deep, coals 17 ft. thick.
69. Dove, N.E. of the town, 2nd coal, brasses.
70. Dronfield, ¼ m. N.W. of the town (formerly all round it), 8th coal.
71. Duckmanton Common, 1 m. S.W. of Long Duckmanton Chapel, 11th and 12th coals (formerly).
72. Duckmanton Furnace. See Adelphi.

73. Eaves Knowl, W. and S.W. of New Mills, Glossop, 2nd coal.
74. Eckington, ¾ m. S.W. of the church, 9th coal.
75. Ernocroft. See Shaw-hay.
76. Far Lane, S.E. of the houses, 1 m. N.W. of Barlow, 7th coal (formerly).
77. Ferneyford. See West Hallam.
78. Ferneylee, W. of the houses, 3½ m., W.S.W. of Chapel-en-le-Frith, 2nd coal (formerly).
79. Four-lane ends, W. of the inn, 1¼ m. W. of Alfreton, 10th coal (formerly).

80. Gander Lane, ¾ m. N.E. of Killamarsh (formerly).
81. Glass-house Common, 1 m. N.N.E. of Whittington, 8th coal.
82. Gleedless Common, E. and N.E. of the village, in Derbyshire and Yorkshire, 2½ m. S.W. of Hansworth, 8th coal (formerly).
83. Gosley-waste, 1 m. S.W. of Hartshorn (formerly).
84. Goyte-moss (or Coit), E. and N. of Moss-houses in Derbyshire and Cheshire, 2½ m. W. of Buxton, 2nd coal.
85. Grass-hill (or Hasland), S.E. of Hasland, 2½ m. S.E. of Chesterfield, 12th coal (an iron furnace and mines).
86. Grass moor, ½ m. W. of Temple Normanton, 12th coal.
87. Green-hill Lane, 2½ m. E.S.E. of Alfreton.
88. Greenwich, ½ m. E. of Ripley, and 1½ m. N.W. of Codnor.
89. Gresley, ½ m. W. of Church Gresley.
90. Gresley-Hall, N. of Castle Gresley in Church Gresley (formerly).

91. Hady, ¾ m. E. of Chesterfield, 8th coal.
92. Hag, ¾ m. N.W. of Dale Abbey (formerly).
93. Hallam-bridge (or Nutbrook), 1 m. N. of Stanton by Dale (formerly).
94. Hall-fields, ¾ m. S.W. of Newhall.
95. Harstoft, W. of the houses, 1½ m. N. of Tibshelf (formerly).
96. Harts-hay, 1 m. S. of Pentrich, 12th coal.
97. Hartshorn, ½ m. N.E. of the town (formerly) and ½ m. S. of the town (formerly).
98. Harwood Grange, ½ m. S. of the cupola, 2¾ m. E. of Beeley (dug open formerly).
99. Hasland, N.E. 1½ m. S.E. of Chesterfield, 9th coal (formerly).
100. Hasland, see Grass-hill.
101. Hazlewell, ½ m. W. of Barlborough (formerly).
102. Heage (or Buckland-hollow), N. of the town, 4th coal (formerly).
103. Heage-bent (or Netherend), W. and S.W. of the town, 3rd coal (formerly).
104. Heanor, ½ m. S.E. of the town, brasses, S.S.W. and W. of the town.
105. Heath, ¾ m. W. and S.W. of the town, and ½ m. N.E. by S. and S.E. and in the intermediate space, 12th coal (formerly).
106. Henmore, 1½ m. W.S.W. of North Winfield Canal, 8th coal.
107. High-Ash, N.E. of the houses, 1½ m. W. of Barlow, 7th coal (formerly).
108. Higham, S. of the village, ½ m. W. of Shirland, 9th coal.
109. High-field Lane (Boden's) near Four-lane-ends, 1 m. W. of Alfreton (formerly).

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110. High-house (or Owlcote), ½ m N.W. of Heath, 12th coal.
111. High Lane, N. of the houses, 2¼ m. N.W. of Ecklington, 8th coal.
112. Hill-top, ½ m. S. of Dronfield, 8th coal.
113. Holbrook, ½ m. E. of the town, 3rd coal (lately).
114. Hollingwood Common, ½ m. E. of Brimington, 8th, 9th, and 10th coals, worked by a tunnel for boats.
115. Holly-wood (Bilborough), ¾ m. S.E. of Bilborough Church, in Nottinghamshire, under yellow lime.
116. Hopping Hill, E. of the houses, 1½ m. S. of Belper; 1st coal (formerly).
117. Horsecroft, see Stanfrey.
118. Horsley, ½ m. N.E. of the church, 4th coal (formerly).
119. Horsley-Woodhouse, W. of the houses, 1 m. N.E. of Horsley (formerly).

120. Ilkeston, S. of the church (formerly).
121. Ilkeston Common (or Bennersley), 1 m. N.E. of the town.

122. Killamarsh Nether-moor, ½ m. N.W. of the Church, 12th coal (formerly).
123. Killamarsh, Old Delph, S. of the church, 13th coal (formerly).
124. Knittaker (or Nittacar), 1 m. N.E. of Barlborough, part under yellow lime (formerly), a great fault between this and Pebbley-lane colliery.

125. Lane End, see Belper.
126. Langley Mill, S. of the houses, ½ m. E. of Heanor.
127. Lea, S. of the village, 2½ m. S.E. of Matlock, 1st coal (formerly).
128. Lees Hall, 1 m. N.W. of Norton, 5th coal.
129. Lings, ¾ m. S.S.W. of Temple-Normanton, 12th coal.
130. Little Common, in Brampton, 1½ m. W. of Chesterfield, 8th coal (lately).
131. Little Hallam, N. of the village, ½ m. S. of Ilkeston (formerly).
132. Loco Lane, 1½ m. S.E. of North Winfield (formerly).
133. Longhurst Lane, ½ m. W. of Mellor Chapel, in Glossop 2nd coal.
134. Longway Bank (or Longnor), 1 m. N. of Alderwasley in Wirksworth, 1st coal (formerly).
135. Lounsley Green, 1¾ m. W.N.W. of Chesterfield, 8th coal.
136. Lower Hag, 1 m. N.W. of Dale Abbey (formerly).
137. Lower House (or Cuckoo-bush Hill) ¾ m. W. of New Mills, in Glossop, 2nd coal.
138. Ludworth, near Compstal Bridge, 1½ m. N.W. of Mellor, in Glossop, 2nd coal, crowstone.
139. Lunsdale, 1 m. N.E. of Matlock, 1st coal (lately).

140. Measham, N. and N.E. of the town (formerly).
141. Measham-fields, 1 mile E.S.E. of Measham.
142. Middle Duckmanton, ½ m. N.N.W. of Long Duckmanton (formerly).
143. Miln-hay, 1 m. E.N.E. of Heanor (formerly).
144. Moor-top (or Duckmanton Common), S. of Calow, 2½ m. E.S.E. of Chesterfield, 9th coal (formerly).
145. Moor-top, (Top of Moor,) near Chinley-hay, 2 m. S.S.W. of Hayfield, 2nd coal.
146. Morley, ½ m. E. of the town (formerly).
147. Morley Park, 1 m. S.S.E. of Heage, 9th coal (an iron furnace and mines).
148. Mossborough Moor, N.W. of the village, 1½ m. N.W. of Eckington, 8th coal.
149. Nether Birchwood, 2 m. S.E. of Alfreton.
150. Nether-field, 1 m. S.S.E. of Beighton, 12th coal (formerly).
151. Newbold Common, 1¾ m. N. of Chesterfield, 10th coal (formerly), now ½ m. W. of this.
152. Newbold-field, N. of the house, 2½ m. N.W. of Chesterfield, 10th coal (formerly).
153. New Brampton, 1 m. W. of Chesterfield, 7th and 8th coal (formerly).
154. Newhall, 1 m. S.W. of the village, in Staperhill.
155. Newhall Park, W. of the village, 1¾ m. N.W. of Church Gresley (formerly).
156. Newton, ½ m. E.N.E. of Blackwell (formerly).
157. Norbriggs, ½ m. E.N.E. of Staveley, 12th coal.
158. Nuthall, on the S. side of the Park, 1 m. N.N.W. of Bilborough, Notts, under yellow lime, 160 yards deep (formerly).

159. Oakerthorpe, E. of the village, 1 m. S.W. of Alfreton, 12th coal.
160. Oakthorpe, E. of the village, ¾ m. N. of Measham (formerly).
161. Old-hall-wood, ⅝ m. W.S.W. of Mellor Chapel in Glossop, 2nd coal (formerly).
162. Openwood-gate, ⅝ m. S.S.E. of the houses, 1¼ m. S.E. of Belper, 3rd coal (formerly), crowstone.
163. Over-thorp, ½ m. S.W. of Killamarsh, 12 coal (lately).
164. Oneston (or Ouaston), S.E. of the village, 1½ m. S.E. of Dronfield, 8th coal (formerly).
165. Owlcotes, *see* High-house.

166. Patterton, W. of the houses, 1¼ m. S.S.W. of Bolsover (formerly).
167. Pebbly-lane, W. of the inn, 1½ m. N. of Barlborough (formerly) a great fault between this and Knittaker Colliery.
168. Pentrich, ½ m. S.S.E. of the town, 12th coal.
169. Perkins, ½ m. E.S.E. of Newhall (formerly).
170. Pilsley-lane, 1½ m. S.S.E. of North Winfield (formerly).
171. Pingle, ½ m. N.W. of Dale Abbey (formerly).
172. Pinxton, ½ m. N.E. of the church, and ½ m. E.S.E. (formerly), also S.W. and N.W. of the church.
173. Pistern, 1½ m. N.N.W. of Smisby, 1½ m. from Hartshorn (formerly).
174. Plaistow Green, S.E. of the houses, 1 m. N.N.E. of Crich, 1st coals (formerly).

175. Riddings, S.E. of the village, 2¾ m. S.E. of Alfreton.
176. Ringing-low-bar, S.W. of the inn, 2½ m. N.W. of Dore, 2nd coal crowstone.
177. Ripley, S.W. of the village, 1½ m. S.S.E. of Pentrich.
178. Roby East-field, 1 m. E. of Denby Church (lately).
179. Roby West-field, ¾ m. N.W. Denby Church.
180. Round-hole, 1 m. N.E. of Church Gresley (lately).

181. Salters-sitch, S.W. of Outer bar, 1¾ m. W. of Holmsfield, 2nd coal (formerly), crowstone.
182. Shallcross (or Shawcross), E. of Taxhall, 2¾ m. W.S.W. of Chapel-en-le-frith.
183. Shaw-hay (or Emocroft), 1½ m. N. of Mellor in Glossop, 2nd coal.
184. Shipley, 1 m. S.S.E. of Heanor, brasses 224 yards deep.
185. Shirland, ½ m. S. of the town, 11th coal.
186. Shuttlewood Common, 1½ m. N. of Bolsover (formerly).
187. Simondley, S.W. of the village, 2 m. S.W. of Glossop, 2nd coal.
188. Simonfield, S.E. of Park Hall, 1 m. S.E. of Smalley (formerly).
189. Slack-fields, ½ m. E. of Horsley, 4th coal.
190. Smalley, ½ m. N.N.E. of the town (formerly).

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191. Smalley Common, ¾ m. S.S.W. of the town (formerly).
192. Smithy-houses, N.E., ½ m. N.W. of Denby Church (formerly).
193. Smithy Moor, S.W. of Stretton, 1¾ m. N.N.W. of Shirland, 9th coal (formerly), marley bind.
194. Somercotes, E. of the village, 2¼ m. S.E. of Alfreton.
195. Somercotes-furnace (or Alfreton-furnace), S.E. of the village, 2½ m. S.E. of Alfreton, an iron furnace and mines.
196. South Normanton, ½ m. S. of the church.
197. Spinkhill Common, E. of the village, 1¼ m. N.W. of Barlborough, 12th coal.
198. Stanage-pole, S.W. of the pole, 1¼ m. N.N.E. of Hathersage, 1st coal (formerly).
198a. Stanfrey (or Horsecroft), E. of the houses, 2¼ m. N.N.E. of Bolsover (lately).
199. Stanley Common, 1 m. N.W. of West Hallam (formerly).
200. Stanton, at S.E. end of Stanton Ward, 1¼ W. of Newhall.
201. Stanton-by-Dale (or Nutbrook), *see* Hallam Bridge.
202. Staveley, 1 m. S.W. of the town, 12th coal.
203. Stone-gravel, ⅔ m. N. of Chesterfield, 9th coal; also ½ m. S.W. of this.
204. Stretton, E. of the village, 2 m. N.N.W. of Shirland, 9th coal.
205. Stubley, 1¼ m. N.W. of Dronfield, 8th coal (formerly).
206. Sudbrook (or Sudale), ⅛ m. S.S.E. of Barlow, 8th coal.
207. Sutton (in Scarsdale), ¼ m. N.W. of the church, 12th coal (formerly).
208. Sutton Common (in Scarsdale), ⅔ m. N.W. of the church, 10th, 11th, 12th and coal (formerly).
209. Swadlingcote, ⅓ m. N.W. of the village, ½ m. S.S.E. of Newhall, smithy coal.
210. Swanwick-delves, E.S.E. of the houses, 1¾ m. S.S.E. of Alfreton.
211. Swanwick-green, 1½ m. S.S.W. of Alfreton, brasses.
212. Swinney, ½ m. N.E. of Belper Bridge, 1st coal (formerly).
213. Tansley-green, 1¼ m. W. of Matlock, 1st coal (formerly).
214. Tapton, ¼ m. S. of the hall, N.E. of Chesterfield, 8th coal (formerly).
215. Thatch-marsh, in Hartington, 2 m. S.W. of Buxton (works 2¼ m. long), 1st coal, brasses; worked by a railway tunnel.
216. Thickwood, N.W. of outer bar, 1¾ m. W.N.W. of Holmsfield in Dronfield, 2nd coal (formerly).
217. Tibshelf, ⅛ m. S. of the church.
218. Ticknall, at S.W. end of the town (formerly).
219. Tor-mine, ⅛ m. S.W. of New Mills, in Glossop, 2nd coal (formerly).
220. Town-field, 1 m. N.W. of Heage, 1st coal (formerly).
221. Troway, S. of the village, 2½ m. E.S.E. of Eckington, 8th coal, smithy coal.
222. Tupton-green, 1 m. N.W. of North Winfield, 9th coal.
223. Waterfield, E. of Stanton, 1¼ m. W.S.W. of Newhall (lately).
224. Westfield (or Sough), ⅛ m. S.W. of Barlborough (formerly).
225. West Hallam (or Ferneyford), near Lewcotegate, 1 m. N.E. of West Hallam.
226. West Hallam Windmill-hill, ⅛ m. N.W. of the town, and also ⅛ m. E. of it (formerly).
227. Wheat-croft, in Crich, N.W. of the village, 1st coal (formerly).
228. White-holly-coppy, S. of the houses, 1⅛ m. S. of Ticknall (formerly).
229. Whittington Moor, ⅝ m. S.E. of the church, 10th coal.
230. Wigwell, N.E. of the houses, 1¾ m. E.N.E. of Wicksworth, 1st coal (formerly).
231. Wildens-mill, ⅜ m. W.N.W. of Brimington, 8th coal.
232. Wilders-green, N.W. of the houses, 1¼ m. W. of Barlow, 17th coal (formerly).
233. Wingerworth-furnace, N. of Woodthorp, 3 m. S. of Chesterfield, 7th coal (formerly), an iron furnace and mines.
234. Wingerworth-park, N.W. of the hall, 2 m. S. of Chesterfield, 9th coal.
235. Wooden Box, E. of Swadlingcote, 1½ m. S.E. of Newhall (lately).
236. Wood-field (or Park-gate), ⅛ m. N. of Newhall (formerly),
237. Woodhouse (or Stubley), ¼ m. S.W. of the village, 1¼ m. W. of Dronfield, 8th coal.
238. Woodhouse-lane, ⅛ m. S.W. of Smalley Church (formerly).
239. Wood-nook, 1¼ m. W.N.W. of Sutton, in Scarsdale, 19th coal (formerly).
240. Woodthorp, W. of Tupton, 1¼ m. W.N.W. of North Winfield, 7th and 8th coals (formerly).
241. Woodthorp, N. of the houses, 1¼ m. E. of Staveley, 12th coal (formerly).
242. Woodwards-close, S. of Swadlingcote, 1 m. N.E. of Church Gresley.

APPENDIX, No. 22.

LIST of CANALS carrying COAL for which the Royal Assent was obtained to the Acts for constructing the same before 1800.

NORTHUMBERLAND, DURHAM, and CUMBERLAND, &c.

	Dates at which the Royal Assent was obtained.
Eden River, *Westmoreland*	1721
Foss Navigation, Durham	1793
Wear River	1716, 1726, 1747, 1759, 1785

YORKSHIRE, NOTTINGHAM, DERBYSHIRE, &c.

Aire and Calder Navigation	1699, 1744
Barnsley Canal	1793
Beverley Beck	1726, 1744
Bradford Canal	1771
Brandley's railroad from collieries	1758
Calder and Hebble Navigation	1758, 1769
Chesterfield Canal	1771
Coventry Canal	1768, 1786
Cromford Canal	1789
Dane River	1720
Dean and Dove Canal	1793
Derby Canal	1793
Derwent River	1701, 1720
Driffield Navigation	1767
Dun River Navigation	1726, 1727, 1732, 1739
Erewash Canal	1777
Foss Navigation	1793
Hedon Haven	1774
Huddersfield Canal	1794
Humber and Ouse	Henry 8th, 1531, 1532
Kingstown-upon-Hull	1774, 1783
Leeds and Liverpool	1720, 1770, 1783, 1790, 1794
Leeds and Selby	
Leicester Navigation	1791, 1797
Leicestershire and Northampton Union	1793
Louth Canal	1763
Market Weighton Canal	1772
Nutbrook and Shipley Canal	1793
Nottingham Canal	1792
Oakham Canal	1793
Ouse River, York	1462, 1657, 1727, 1732, 1767
Ouse River, Bedfordshire	1670, 1750, 1795, 1796
Peak Forest Canal	1794
Ramsden's, Sir John, Canal	1774
Rochdale Canal	1794
Soar River	1766, 1776
Stainforth and Keadby	1793, 1798

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	Dates at which the Royal Assent was obtained.
Thanet Canal	1773
Trent River	1699, 1770, 1772, 1793, 1794
Trent and Mersey	1766, 1770, 1775, 1776, 1783, 1797
Uxe River	1767
Welland River	1571, 1772, 1794

Staffordshire, Warwickshire, &c.

Birmingham Canal Navigation	1768, 1759, 1783, 1784, 1794
Coventry Canal	1768, 1786
Droitwich	1768
Dudley	1776, 1785, 1790, 1793
Gresley Canal	1775
Leominster or Kington and Leominster Canal	1791, 1796
Newcastle-under-Lyne	1795
Newcastle-under-Lyne Junction Canal	1798
Shrewsbury Canal	1793
Shropshire Canal	1788
Staffordshire and Worcestershire	1766, 1790
Stourbridge Canal	1776, 1782
Stour and Salwerp Rivers	1662
Strafford-upon-Avon Canal	1793, 1795, 1799
Trent River	1699, 1770, 1793, 1794
Warwick and Birmingham	1793, 1796
Warwick and Napton Canal	1794, 1796
Worcester and Birmingham Canal	1791, 1798

Lancashire and Cheshire, and North Wales.

Ashton-under-Lyne Canal	1792, 1793, 1798
Bridgewater, Duke of	1737, 1759, 1760, 1762, 1766, 1795
Dee River	1700, 1734, 1740, 1753, 1791
Douglas Navigation. *See* Leeds and Liverpool.	
Ellesmere and Chester Canal	1772, 1777, 1778, 1793 1796
Lancaster Canal	1792, 1793, 1796
Liverpool Docks and Harbour	1710, 1716, 1737, 1762, 1785, 1799
Loyne or Lune River	1749, 1772, 1789
Manchester, Ashton, and Oldham. *See* Ashton-under-Lyne.	
Manchester, Bolton, and Bury	1791
Mersey and Irwell Navigation	1720, 1794
Rochdale Canal	1794
Sankey Canal	1755, 1762
Thanet Canal	1773
Ulverstone Canal	1793
Weaver Navigation	1720, 1734, 1760
Wigan Branch	
Worsley Brook	

Somersetshire and Gloucestershire, &c.

Avon River, Charles 2nd,	1664
Ditto	1712, 1751, 1793
Avon and Frome Rivers	1700, 1749
Coombe Hill Canal	1792
Dorset and Somerset Canal	1796
Gloucester and Berkeley Canal	1793, 1797
Grand Western	1796
Hereford and Gloucester	1791, 1793
Ivelchester and Langport	1795
Kennet and Avon Canal	1794, 1796, 1798
Kennet River	1715, 1720, 1730
Severn River	1503, 1531, 1772, 1779
Somersetshire Coal Canal	1794, 1796
Stroudwater Navigation	1730, 1759, 1776
Thames and Severn Canal	1783, 1791, 1796
Tone River or Tone and Parrett Navigation	1699, 1707

South Wales and Monmouthshire.

Brecknock and Abergavenny	1793
Glamorganshire Canal	1790, 1796
Kidwelly Canal	1766
Monmouthshire Canal	1792, 1797
Montgomeryshire Canal	1794
Neak Canal	1791, 1798
Swansea Canal	1794

Scotland.

	Dates at which the Royal Assent was obtained.
Cart River, *Renfrew*	1753, 1787
Clyde Canal	1759, 1768, 1770, 1774
Crinan Canal	1793, 1799
Forth and Clyde Canal	1768, 1771, 1773, 1784, 1787, 1790, 1799
Monkland Canal	1770

Sundry.

Grand Junction Canal	1793 to 1798
Oxford Canal	1769, 1775, 1786, 1799

Appendix, No. 23.

Comparative Statement of the Price of English and Scotch Coals, sold in the Firth of Forth, per chaldrom of 54 cwt.

	s.	*d.*	*s.*	*d.*
The high main, or best Newcastle	18	0		
Keel dues, town house dues, Duke of Richmond's dues, &c.	4	0		
Freight to the Forth, 5*s.* per ton	13	6		
			35	6
Second ditto	16	0		
Keel dues, &c. &c.	4	0		
Freight	13	6		
			33	6
Third ditto	15	0		
Keel dues, &c. &c.	4	0		
Freight	13	6		
			32	6
Slack, or the most inferior *small* coal for glass works, &c. &c.	12	0		
Keel dues	4	0		
Freight	13	6		
			29	6

Appendix No. 24.

List of Iron Furnaces in DERBYSHIRE in 1806.

No.	Places, and Date of Building.	Owners.	No. of Furnaces. In blast.	Out.	Total.	Tons of Pig Iron made annually.
1	Morley Park	Francis Hurt	1	–	1	700
2	Chesterfield (Griffin, or New Brampton)	Eb. Smith and Co.	2	1	3	1,700
3	Chesterfield (Stone Gravel), Chesterfield Canal.	Top and Co. (now Smith and Armitage.)	1	1	2	709
4	Wingerworth (1780)	Joseph Butler	1	1	2	819
5	Staveley (1796), near Chesterfield Canal.	Ward and Low (now Ward and Barrow)	1	–	1	596
6	Dale Abbey (1788), railway to Nutbrook Canal.	Late English & Co. (now pulled down)	–	1	1	—
7	Butterley (1792), Cromford Canal.	Outram & Co. (now Butterley & Co.)	2	1	2	1,766
8	Renishaw (1792), Chesterfield Canal.	Appleby & Co.	1	1	2	975
9	Alfreton (or Somercotes), border of Cromford Canal.	Saxleby & Co. (now Oakes, Edwards, & Co.	1	–	1	1,450
10	Hasland (or Grass Hill)	John Brocksop	1	–	1	723
11	Duckmanton (or Adelphi), 1799.	Eb. Smith & Co	1	1	2	900
			12	6	18	10,329

Farey's Derbyshire, p. 397.

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Appendix No. 25.

Canals for which Acts of Parliament have been obtained since 1800 to 1827.

	Date at which the Royal Assent was first obtained.
Aber Dulais Railway	1826
Adur River, Sussex	1807
Aford Canal, Lincolnshire	1826
Axe River, Somersetshire	1802
Baybridge Canal, Sussex	1825
Birmingham and Liverpool Junction Canal	1826
Bridgewater and Taunton Canal	1811
Bury, Loughor, and Lliedi Rivers, Carmarthenshire	1813
Caledonian Canal	1803
Carlisle Canal	1819
Croydon Canal	1801
Edinburgh and Glasgow Union Canal	1817
English and Bristol Channels Ship Canal	1825
Glasgow, Paisley, and Ardrossan Canal	1806
Glastonbury Navigation	1827
Glenkenns Canal, Kirkcudbright	1802
Grand Surrey Canal	1801
Hertford Union Canal	1824
Hull and Leven Canal	1801
Isle of Dogs Canal	1807
Kensington Canal	1824
Leven Canal	1801
Liskeard and Looe Canal	1825
London and Cambridge Junction Canal	1812
Macclesfield Canal	1826
Mersey River	1805
Newport Pagnell	1814
Nith or Nidd River Navigation	1811
North Walsham and Dilham Canal	1812
North Wilts Canal	1813
Norwich and Lowestoft Navigation	1827
Pembrey Harbour Canal and Railway	1825
Penclawdd Canal	1811
Pocklington Canal, York	1815
Portsmouth and Arundel Canal	1817
Regent's Canal	1812
Shorncliff and Rye Canal	1807
Severn and Wye Railway and Canal	1809
Sheffield Canal	1815
Tavistock Canal	1803
Tees Navigation	1808
Thames and Medway Canal	1800
Weald of Kent Canal	1812
Wey and Aran Junction Canal	1813

Appendix No. 26.

A Statement of the Total Sales of Coal (by Canal) from the Collieries of the Erewash Valley District in forty-five years (1803–1869 inclusive).

	Tons.
1803	254,268
1804	234,474
1805	235,004
1806	267,204
1807	285,069
1808	303,837
1809	321,056
1810	265,151
1811	287,200
1812	279,280
1813	301,345
1814	305,157
1815	298,482
1816	280,592
1817	241,570
1818	236,372
1819	262,722
1820	313,877
1821	331,840
1822	279,441
1823	319,873
1824	318,624
1825	370,078
1826	294,747
1827	288,676
1828	276,552
1829	256,732
1830	253,498
1831	255,759
1832	299,079
1833	316,187
1834	295,473
1835	343,154
1836	377,103
1837	402,675
1838	350,146
1839	377,606
1840	420,418
1841	416,034
1842	410,945
1843	330,869
1844	334,159
1845	412,405
1846	385,605
1847	475,779
1848	427,670

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Appendix 27.

COLLIERIES OF THE UNITED KINGDOM AT WORK IN 1869.

SUPPLIED, BY ORDER OF THE SECRETARY OF STATE FOR THE HOME DEPARTMENT, BY THE INSPECTORS OF COAL MINES.

Names of Inspectors.	District under Inspection.
George W. Southern, Esq., 89, Park Road, Newcastle-on-Tyne.	Northumberland, Cumberland, and Durham North of the Wear.
John J. Atkinson, Esq., Chilton Moor, Fence Houses* - - James Willis, Esq., *appointed January* 1871.	Durham South of the River Wear in its course from the Sea at Sunderland up as far as Harraton near Chester-le-Street, and from thence westward, the line of the Pontop and Shields branch of the North-eastern Railway.
Frank N. Wardell, Esq., Sandal House, Wakefield - -	The West Riding of Yorkshire.
Thomas Evans, Esq., Field Head, Belper - - - -	Derby, Nottingham, Warwickshire, and Leicester.
Thomas Wynne, Esq., Stone - - - - -	North Staffordshire, Shropshire, and Cheshire.
James P. Baker, Esq., Tattenhall, Wolverhampton - -	South Staffordshire and Worcestershire.
Joseph Dickinson, Esq., Pendleton, Manchester - -	North and East Lancashire, called the Manchester District.
Peter Higson, Esq., Brooklands, Swinton, Manchester - -	West Lancashire, the Wigan and St. Helen's Districts, and North Wales.
Lionel Brough, Esq., 11, West Mall, Clifton, Bristol - -	Monmouthshire, Gloucestershire, Somersetshire, and Devonshire.
Thomas E. Wales, Esq., Brunswick Place, Swansea - -	South Wales Coal Field.
Ralph Moore, Esq., 7, Queen's Square, Glasgow - -	Scotland. — *Eastern Division* — including East Lanarkshire, Fifeshire, Clackmannanshire, Haddingtonshire, Edinburghshire, Linlithgowshire, East Stirlingshire, &c.
William Alexander, Esq., 23, India Street, Glasgow - -	Scotland. — *Western Division* — including Ayr, Dumfries, Dumbarton, West Division of Stirling, and part of Lanarkshire.

* Since dead.

ENGLAND.

NORTHUMBERLAND, NORTHERN DIVISION OF DURHAM, AND CUMBERLAND.

Inspector, George W. Southern.—Newcastle-on-Tyne.

No.	Name of Colliery.	Where situated.	Owner's Name.
		Seasale Collieries.	
		District of Tyne, Blyth, and Coquet.	
1	Allerdean - - -	Newcastle - - -	W. W. Burdon.
2	Andrews House - - -	Gateshead - - -	The Marley Hill Coal Company.
3	Ashington and Bothal - -	Morpeth - - -	Henderson and Company.
4	Backworth - - - -	Newcastle - - -	Maud, Taylor, and Company.
5	Barrington - - -	Morpeth - - -	Bedlington Coal Company.
6	Beamish - - - -	Gateshead - - -	Messrs. Joicey and Company.
7	Bedlington - - -	Morpeth - - -	Bedlington Coal Company.
8	Bebside - - - -	Blyth - - -	Lambert, Nicholson, and Company.
9	Bewicke Main - - -	Gateshead - - -	Hunt, Perkins, and Company.
10	Biddick, North - - -	Washington Station - -	George Elliot and Company.
11	Bishops Hill - - -	Haltwhistle - - -	M. Thompson and Sons.
12	Blacksike - - - -	,, - - - -	,, ,,
13	Blaydon Burn - - -	Gateshead - - -	Joseph Cowan and Company.
14	Blaydon Main - - -	,, - - -	Messrs. Ramsay and Company.
15	Blenkinsop - - -	Near Haltwhistle - -	M. Thompson and Sons.
16	Broomhill - - - -	Morpeth - - -	Burdon and Company.
17	Burnopfield - - -	Gateshead - - -	The Marley Hill Coal Company.
18	Burradon - - - -	Newcastle - - -	Joshua Bower.
19	Byer Moor - - -	Gateshead - - -	The Marley Hill Coal Company.
20	Cambois - - - -	Blyth - - -	Cowpen and North Seaton Coal Company.
21	Choppington - - -	,, - - -	Lambert, Nicholson, and Company.
22	Coan Wood - - -	Haltwhistle - - -	Wilson and Crawhall.
23	Cox Lodge - - -	Newcastle - - -	Joshua Bower.
24	Cramlington, East - - -	,, - - -	Lamb, Potter, and Scott.
25	Cramlington, West - -	,, - - -	Lamb, Maud, Taylor, and Company.
26	Cowpen - - - -	Blyth - - -	Cowpen and North Seaton Coal Company.
27	Dand's, or Togston, N. - -	Acklington - - -	Cowan and Company.
28	Derwent - - - -	Medomsley, Gateshead - -	Consett Iron Company.
29	Derwent, South - - -	Annfield Plane, Gateshead -	Dickinson and Company.
30	Dinnington - - - -	Near Newcastle - - -	J. Bowes and Partners.
31	East Castle - - -	Medomsley, Gateshead - -	Bainbridge, Kissop, and Company.
32	Ebchester - - - -	,, ,, - -	Consett Iron Company.
33	Eden - - - - -	,, ,, - -	,, ,,
34	Elswick - - - -	Newcastle - - -	Elswick Colliery Company.
35	Felling - - - -	Gateshead - - -	Elliot and Company.
36	Fenham - - - -	Newcastle - - -	Bainbridge and White.
37	Garesfield - - -	Gateshead - - -	Marquis of Bute.
38	Gosforth and Killingworth -	Newcastle - - -	Bowes, Hutt, and Company.
39	Green Side - - -	Haltwhistle - - -	M. Thompson and Sons.
40	Handen Hold - - -	Gateshead - - -	Messrs. Joicey and Company.
41	Harraton - - - -	Chester-le-Street - -	Earl of Durham.
42	Harton - - - -	South Shields - - -	Harton and Hilda Coal Company.
43	Heworth - - - -	Gateshead - - -	Henderson, Anderson, and Company.
44	Holywell, East - - -	North Shields - - -	Hugh Taylor and Company.
45	Kettledrum Pit, West Stanley -	Near Newcastle - - -	D. Burn.
46	Kibblesworth - - -	Gateshead - - -	The Marley Hill Coal Company.
47	Lambley - - - -	Near Haltwhistle - -	M. Thompson and Sons.

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No.	Name of Colliery.	Where situated.	Owner's Name.
48	Lintz Hall	Gateshead	Gooch and Company.
49	Longhirst	Near Morpeth	Rev. Ed. Lawson.
50	Marley Hill	Gateshead	The Marley Hill Coal Company.
51	Medgeholme	Haltwhistle	M. Thompson and Sons.
52	Medomsley	Gateshead	Consett Iron Company.
53	Mickley	„	Cookson, Cuthbert, and Liddell.
54	Mount Moor	„	The Marley Hill Coal Company.
55	Mount Pleasant	Medomsley, Gateshead	Consett Iron Company.
56	Monkwearmouth	Sunderland	Bell, Stobart, and Company.
57	Montagu Fire Clay Pit	Near Newcastle	W. Ridley Carr.
58	Montague Main	Newcastle	William Benson.
59	Netherton or Howard's West Hartley.	Morpeth	Jackson, Bean, and Stewart.
60	Newsham	Blyth	Cowpen and North Seaton Coal Company.
61	North Seaton	„	„ „ „
62	North Wylam	Wylam-on-Tyne	Robt. Dunn.
63	Ouston	Gateshead	Hunt, Perkins, and Company.
64	Pontop	„	The Marley Hill Coal Company.
65	Radcliffe	Acklington	Harrison, Carr, and Company.
66	Saint Hilda	South Shields	Wood, Blackett, and Company.
67	Seaton Burn	Newcastle	J. Bowes and Partners.
68	Seaton Delaval	North Shields	Lamb, Burdon, and Company.
69	Seghill	Newcastle	J. Laycock and Company.
70	Sheriff Hill	Gateshead	R. Forster and Company.
71	Shipcote	„	The Marley Hill Coal Company.
72	South Medomsley	Medomsley	Muschamp, Bainbridge, and Company.
73	South Moor	Chester-le-Street	Hedley and Bell.
74	Springwell	Gateshead	The Marley Hill Coal Company.
75	Stanley, East	Chester-le-Street	J. Joicey and Company.
76	Stella	Gateshead	A. Potter and Company.
77	Tanfield, East	„	J. Joicey and Company.
78	„ Lea	„	„ „
79	„ Moor	„	„ „
80	Team (Eighton Moor)	„	W. W. Burdon.
81	Throckley	Newcastle	R. Stephenson and Son.
82	Tyne Main	Gateshead	George Elliot and Company.
83	Townley	„	A. Potter and Company.
84	Togstone	Acklington	W. W. Burdon and Company.
85	Urpeth	Chester-le-Street	Hunt, Perkins, and Company.
86	Usworth	Washington Station	Jonassohn and Elliot.
87	Walbottle	Newcastle	R. O. Lamb.
88	Walker	„	N. Lambert and Company.
89	Washington	Washington Station	Bell, Kimpster, and Company.
90	West Sleekburn	Morpeth	Bedlington Coal Company.

LANDSALE COLLIERIES IN NORTHUMBERLAND AND NORTH DURHAM INSPECTOR'S DISTRICT.

1	Acomb	Newcastle	J. Morrison and Company.
2	Banks, Morpeth	Morpeth	Henderson and Company.
3	„ „	„	James Temple and Company.
4	Barcombe	Hexham	Henderson and Company.
5	Bar Moor.	——	——
6	Benwell (Delaval)	Newcastle	John O. Scott and Company.
7	Benwell, South	„	Cochrane and Company.
8	Berwick Hill	Berwick	Scremerston and Shoreswood Coal Company.
9	Bog Hall	Ponteland	N. Grace and Company.
10	Bows Hill	Bellingham	Jos. Armstrong.
11	Broad Oak.	——	——
12	Callerton	Newcastle	S. Forster.
13	Christin Bank	Berwick.	——
14	Churm	Morpeth	John Straker.
15	Cowden	Hexham	Thompson Osborne.
16	Doddington	Wooler	S. Salisbury.
17	Eltringham	Gateshead	Messrs. Humble.
18	Etal	Wooler	Scremerston and Shoreswood Coal Company.
19	Fell End	Haltwhistle	Snaith, Son, and Hastewell.
20	Ford Moss	Wooler	Marchioness of Waterford.
21	Fallowfield	Hexham	Walton and Cowper.
22	Four Stones	„	William Benson.
23	Framlington	Felton	Messrs. G. and W. Nicholson.
24	Gray Mare	Hexham	— Brown.
25	Greenlaw Walls	Berwick	Scremerston and Shoreswood Coal Company.
26	Gunnerton	Hexham	Joseph Armstrong.
27	Haltwhistle and Fell End	Haltwhistle	Thos. Snaith.
28	Hamsterley	Gateshead	H. W. Watson.
29	Hedley	„	William Walker.
30	Heddon	Newcastle	Thos. Bates.
31	Ingoe	Matfen	Duke of Northumberland.
32	Kirkheaton	Belsay	Grace and Tone.
33	Lynetrope	——	——
34	Lickar	Lowick	Strutt and Allan.
35	Lowick	Berwick	Salisbury and Company.
36	Medomsley Edge	Near Medomsley	E. O. Tregelles.
37	Mickley Bank	Prudhoe	Elizabeth Bewick.
38	Newton-on-the-Moor	Felton	R. G. Reed.
39	Netherwitton	Rothbury	Jas. Temple.
40	Plashetts	Falstone	J. F. Tone and Company.
41	Prestwick	Ponteland	Turner and Young.
42	Prudhoe	Prudhoe	John Johnson.
43	Preston	North Shields	Messrs. Johnson.
44	Rothbury	Rothbury	Jas. Temple.
45	Ryton	Gateshead	R. Simpson.

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No.	Name of Colliery.	Where situated.	Owner's Name.
46	Scotswood Fire Clay Drift	Newcastle	J. Robson.
47	Scremerston	Berwick	Johnson and Carr.
48	Shilbottle	Alnwick	Messrs. Taylor.
49	South Tyne	Haltwhistle	Snaith and Hastwell.
50	Talkington	Berwick	Scremerston and Shoreswood Coal Company.
51	Townhill	,,	,, ,,
52	Whickham	Gateshead	Jas. Snowball.
53	Widdrington	,,	Wm. Barkus.
54	Winlaton	,,	Cowan.
55	,,	,,	G. Ramsay.

CUMBERLAND.

1	Asby	Workington	Irving and Company.
2	Aspatria (Brayton Domain)	Aspatria	John Harris's representatives.
3	Broughton Moor	Maryport	Mrs. Mary Harris.
4	Camerton	Workington	Cook and Company.
5	Cleator Moor	Whitehaven	Whitehaven Hæmatite Iron Company.
6	Clifton	Workington	I. and W. Fletcher and Company.
7	Crossby	Maryport	St. Helen's Colliery Company.
8	Dean Moor	,,	Mrs. Percival.
9	Dearham	,,	John and Thos. Walker.
10	Ellenborough	,,	J. Harris's representatives.
11	Flimby	,,	Wilson and Company.
12	Frizzington	Whitehaven	Musgrave and Company.
13	Gilcruix	Workington	Gilcruix Colliery Company.
14	Gillhead	Maryport	Lucock and Carlton.
15	Grey Southen	,,	Trustees of late John Harris.
16	Harrington	Harrington	Bain, Blair, and Paterson.
17	Limepitts	Maryport	J. Harris's representatives.
18	Melgramfits	Workington	Fletcher and Company.
19	Millbanks	Maryport	J. Harris's representatives.
20	Naworth Collieries	Milton, Carlisle	M. Thomson and Sons.
21	Otterburn	Durham	——
22	St. Helen's	Maryport	St. Helen's Colliery Company.
23	Seaton Moor	,,	,, ,,
24	Threaptwaite	Whitehaven	Ainsworth and Hartley.
25	Whitehaven	,,	Earl of Lonsdale.
26	Workington	Workington	Irving and Company.

SOUTHERN DIVISION OF DURHAM.

Inspector, J. J. Atkinson, Chilton Moor, Fence Houses, in 1869.
James Willis, in 1871.

District of Tyne.

1	Annfield	Lanchester	Hedley Brothers and Partners (sinking).
2	Brooms (Conside)	,,	Consett Iron Company.
3	Burnhope	,,	J. Townley and R. Fletcher.
4	Byron	,,	Sowerby, Phillips, and Company.
5	Charlaw	Durham	Elliot, Hunter, and Company.
6	Chester Moor	Chester-le-Street	Sowerby, Phillips, and Company.
7	Craghead	,,	Hedley Brothers, and Partners.
8	Dryburn Grange	Durham	Earl Vane.
9	Eden Drift	,,	Consett Iron Company.
10	Edmondsley (East)	Chester-le-Street	S. Tyzack and Company.
11	Findon Hill	Durham	Morgan Robinson and Company.
12	Framwellgate Moor	,,	Earl Vane.
13	Holmside	Chester-le-Street	Hedley Brothers.
14	Iveston	,,	Consett Iron Company.
15	Nettlesworth	,,	W. Hunter and George Elliot, M.P.
16	Pelaw, South	,,	Perkins and Company.
17	Pelton	,,	Lord Dunsany and Partners.
18	Pelton, North	,,	D. Burn.
19	Pelton, West	,,	J. Joicey and Company.
20	Pontop, South	Pontop	H. Ritson and Brothers.
11	Sacriston	Durham	Hunter and Elliott.
22	South Moor	Pontop	Hedley, Morrison, and Company.
23	Stanley, West	,,	David Burn.
24	South Tanfield	Chester-le-Street	J. Joicey and Company.
25	Twizel	,,	,,
26	Waldridge	,,	Sowerby, Philipps, and Company.

Wear and Seaham District.

1	Belmont	Durham	C. and W. Bell.
2	Bourn Moor	,,	Earl of Durham.
3	Brancepeth, North	,,	Snowball and Company.
4	Braside	,,	Earl of Durham.
5	Broomside	,,	Charles Bell.
6	Cocken	,,	Earl of Durham.
7	Durham, Old	,,	Earl Vane.
8	Elemore	Hetton	Hetton Coal Company.
9	Eppleton	,,	,,
10	Frankland	Durham	Earl of Durham.
11	Grange, Keepier	,,	H. Morton and Company.
12	Hetton	Hetton	Hetton Coal Company.
13	,, South	,,	Forster and Company.
14	,, North	,,	North Hetton Coal Company.
15	Haswell	,,	Haswell and Shotton Coal Company (Limited).
16	Houghall	Durham	Joseph Love.
17	Houghton-le-Spring	,,	Earl of Durham.

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No.	Name of Colliery.	Where situated.	Owner's Name.
18	Keepier	Durham	Jno. Thwaites.
19	Lady Durham	"	Earl of Durham.
20	Lumley	"	"
21	Little Town	"	"
22	Murton or Dalton	Sunderland	Forster and Company.
23	Newbottle	"	Earl of Durham.
24	Pensher	"	George Elliot and Company.
25	Pittington	Durham	North Hetton Coal Company.
26	Rainton	"	Earl Vane.
27	Ryhope	Sunderland	Ryhope Coal Company.
28	Shincliffe	Durham	Joseph Love.
29	Seaham	Sunderland	Earl Vane.
30	Seaton	"	"
31	Sherburn Hill	Durham	Earl of Durham.
32	" House	"	"
33	Silksworth	Sunderland	Earl Vane (Sinking).
34	Whitwell	Durham	J. M. Ogden.
	Tees, Hartlepool, and Stockton District.		
1	Adelaide	Auckland	Joseph Pease and Company.
2	Auckland Park	"	Black Boy Coal Company.
3	" St. Helens	"	Joseph Pease and Company.
4	" West	"	Bolckow, Vaughan, and Company (Limited).
5	Bitchburn	"	Strakers and Love.
6	" Middle	"	George Pears and Company.
7	" North	"	H. Stobart and Company.
8	" West	"	Thomas Snowdon.
9	Binchester	"	Hunwick and Newfield Coal Company.
10	Bishop's Close	"	Weardale Iron and Coal Company.
11	Black Boy	"	Black Boy Coal Company.
12	Black Prince	Tawlaw	Weardale Iron and Coal Company,
13	Bowburn, West Hetton	Ferryhill	J. Morrison and Company.
14	Bowden Close	Crook	Joseph Pease and Company.
15	Bowes, Cockfield	Cockfield	J. Hedley and Company.
16	Brancepeth	Willington	Strakers and Love.
17	Brancepeth (New)	Durham	Messrs. Cochrane and Company.
18	Brandon	"	Strakers and Love.
19	Butterknowle	Cockfield	Trustees of W. Luke Pratman, deceased.
20	Byers Green	Auckland	Bolckow, Vaughan, and Company (Limited),
21	Castle Eden	Ferryhill	William Cook.
22	Cockfield Fell	Cockfield	Summerson and Company.
23	Cold Knot (Whitfield)	Crook	W. H. Wooler.
24	Constantine	"	The Weardale Iron and Coal Company.
25	Copley	Cockfield	Trustees of W. L. Prattman.
26	" New	"	Thomas Vaughan.
27	Cornsay		Ferens and Love.
28	Coxhoe, West Hetton	Ferryhill	J. Morrison and Company.
29	Crook	Auckland	Chapman and Morson.
30	Crowtrees, West Hetton	Ferryhill	Jas. Morrison and Company.
31	Deanery	Darlington	Joseph Pease and Company.
32	East Howle	"	East Howle Coal and Fire Brick Company.
33	Eldon, or South Durham	"	Smithson and Company.
34	Elm Park	"	C. Bainbridge and Company.
35	Esh	"	J. Pease and Partners.
36	Etherley (Old)	"	Henry Stobart and Company.
37	Evenwood	"	Thompsons and Garbutt.
38	Ferry Hill	Ferry Hill	J. Morrison and Company.
39	Gordon House	Darlington	W. Hedley and Company.
40	Greenhead	"	Snowden and Kellett.
41	Hamsteels	Auckland	Johnson, Reahy, and Johnson.
42	Hargill	Darlington	W. Wooler.
43	Hedley Hope	"	Taylor, Smith, Brothers.
44	Heugh Hall, West Hetton	Ferryhill	J. Morrison and Company.
45	Hunwick	Darlington	The Hunwick Coal Company.
46	Hett	Ferryhill	Bell Brothers.
47	Inkermann	Auckland	Ferens and Love.
48	Job's Hill	"	J. Pease and Company.
49	Kelloe, Old	Ferryhill	M. Forster and Company.
50	Kelloe South (Coxhoe)	"	J. Morrison and Company.
51	" Town	Hartlepool	M. Forster and Company.
52	Lands	Darlington	H. Stobart and Company.
53	Leasingthorne	"	Black Boy Coal Company.
54	Low Bitchburn (Thistle Flat)	"	John Sharp.
55	Ludworth	Ferry Hill	London Steam Collier and Coal Company (Sinking.)
56	Marshall Green	Darlington	G. Pears and Company.
57	Newton Cap	Auckland	H. Stobart and Company.
58	North End	Cockfield	Simpson Walker.
59	Norwood	Darlington	W. Hedley and Company.
60	Oakenshaw	Durham	Strakers and Love.
61	Page Bank	"	Bell Brothers.
62	Raby New	Auckland	Thompson and Garbutt.
63	Railey Fell	"	H. Stobart and Company.
64	Roddy Moor	Darlington	Joseph Pease and Company,
65	Rodridge	Hartlepool	Not in work.
66	Rough Lea	Auckland	H. Stobart and Company.
67	Shildon Lodge	"	Bolckow, Vaughan, and Company (Limited).
68	Shotton	Durham	Haswell and Shotton Coal Company.
69	South Durham	Auckland	Owners of South Durham Colliery.
70	Spenneymoor	Ferryhill	R. S. Johnson and Company.
71	Storey Lodge	Darlington	Thompson and Garbutt.
72	Stanley	Auckland	J. Pease and Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
73	Thornley	Ferryhill	London Steam Colliery Company.
74	Thornley (*Towlaw*)	Tow Law	Weardale Iron and Coal Company.
75	Thrislington	Ferry Hill	J. Morrison and Company.
76	Tindale	Auckland	Sir C. F. Maclean.
77	Towlaw (Black Prince)	Darlington	Weardale Iron and Coal Company.
78	Towlaw Drift	„	Thomas Snowdon.
79	Trimdon	Ferryhill	T. Wood and Company.
80	„ Grange	„	M. Foster.
81	Tudhoe	„	Weardale Iron Compony.
82	Tursdale	„	Bell Brothers.
83	Ushaw	-	Ferens and Love.
84	Vanes Hartley	Cockfield	R. Summerson and Company.
85	Waterhouses (Brandon)	Auckland	Joseph Pease and Company.
86	Westerton	Darlington	Black Boy Coal Company.
87	Whitelee	Auckland	Bolckow, Vaughan, and Company.
88	Whitworth	Darlington	R. S. Johnson and Company.
89	Willington, Sunny Brow	„	Strakers and Love.
90	Wingate Grange	Ferryhill	J. Gulley's Executors.
91	Witton Park	Darlington	Kirsop and Company.
92	Woodhouse Close	Auckland	Sir C. F. MacLean, Bt.
93	Woodifield, Crook	„	Bolckow, Vaughan, and Company (Limited).
94	Wooley	Crook	J. Pease and Company.

LANDSALE COLLIERIES IN THE SOUTH DURHAM INSPECTION DISTRICT.

1	Carterhorne	Witton-le-Wear	Henry Chayter.
2	Crake Scarr	Cockfield	J. Hardy and Company.
3	Elvet	Durham	T. Crawford.
4	Edge	Cockfield	John Hardy.
5	Esh	Durham	Roger and John Halliday.
6	Hill Top	„	„
7	Howden	Crook	G. Hutchinson and Company.
8	Woodland Fell	Cockfield	Thomas May and Son.

YORKSHIRE.

H.M. Inspector, FRANK N. WARDELL, Sandal, Wakefield.

1	Cullingworth	Bingley	Edward Townsend.
2	Denholme	„	Townend Brothers.
3	„	„	„
4	Shipley Moor	„	Briggs and Sons.
5	Wilsden	„	Wood and Son.
1	Agnes	Barnaley	William Day.
2	Blacker Main	„	Blacker Main Coal Company.
3	Bloomhouse Green	„	Henry Lodge.
4	Church Lane (Dodworth)	„	Messrs. Charlesworth.
5	Darfield	„	Darfield Main Coal Company.
6	Darley Main	„	Croft and Company.
7	Darton	„	Darton Coal Company.
8	East Gawber	„	Craik and Company.
9	Ellis Laith	„	Leather and Littlewood.
10	Edmund's Main	„	Mitchell and Company.
11	Gawber Hall	„	Messrs. Greaves,
12	Haigh	„	Fountain and Son.
13	Hall Royd (Silkstone)	„	Haynes and Company.
14	High Road and Elsecar	„	Hall and Company.
15	High Stile	„	High Stile Coal Company.
16	Hoyland and Elsecar	„	Wells and Company.
17	Lund Hill	„	Lund Hill Coal Company.
18	Moor House	„	Fountain and Son.
19	Monk Bretton	„	Monk Bretton Coal Company.
20	Mount Osborne	„	William Day.
21	New Gawber Hall	„	Sturges, Paley, and Company.
22	North Gawber	„	Thorp's Executors.
23	Oaks	„	Barber and Company.
24	Old Mill	„	William Day.
25	Old Silkstone	„	R. C. Clarke.
26	Old Silkstone Main	„	Cooper and Company.
27	Pinder Oaks	„	Croft and Company.
28	Rockley Coal and Ironstone	„	Cooper and Company.
29	Silkstone Fall	„	Adshead and Company.
30	Silkstone Main	„	G. Howarth.
31	Silkstone New, or Higham	„	Messrs. Charlesworth.
32	Swaithe Main	„	Mitchell and Company.
33	Strafford	„	Strafford Coal Company.
34	Victoria	„	Sutcliffe and Company.
35	West Gawber	„	Henry Durden.
36	West Silkstone	„	Kirsop and Bainbridge, Brothers.
37	White Hill or Penny Pie (Dodworth).	„	Messrs. Greaves.
38			
39	Wharncliffe Silkstone	„	Wharncliffe Silkstone Coal Compnny.
40	Willow Bank	„	Thorp's Executors.
41	Wombwell Main	„	Wombwell Main Coal Company.
42	Woolley	„	Woolley Coal Company.
43	Worsborough Park	„	Cooper and Company.
1	Allerton	Bradford	Bowling Iron Company.
2	„	„	Wood and Son.
3	Aycliffe Hill (Horton)	„	Rushworth and Company.
4	Bolton Wood	„	Handforth and Company

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No.	Name of Colliery.	Where situated.	Owner's Name.
5	Booth Holme Wood	Bradford	Holliday and Clough.
6	Bowling	"	Hird, Dawson, and Hardy.
7	"	"	Joseph Beanland.
8	"	"	Bowling Iron Company.
9	"	"	E. Gittins.
10	Bradford	"	Bowling Iron Company.
11	Broom Hall	"	Thomas Pitts.
12	Bunkers Hill	"	Bowling Iron Company.
13	Cleckheaton	"	" "
14	"	"	Hird, Dawson, and Hardy.
15	Clifton	"	" "
16	Cotton Hole (North Bierley)	"	B. Collingham.
17	Cutler Height	"	Hird, Dawson, and Hardy.
18	Dog Lane	"	G. Mortimer.
19	Eccleshill	"	Thomas Tomlinson.
20	Haycliffe Hilt (Horton)	"	John Bottomley.
21	Heaton	"	Briggs and Sons.
22	" (Shipley)	"	George Heaton.
23	Holme Bank	"	Hird, Dawson, and Hardy.
24	Hunsworth	"	Bowling Iron Company.
25	Laister Dyke	"	Joseph Cliffe and Son.
26	Little Horton	"	Charles North.
27	North Bierley	"	Bowling Iron Company.
28	"	"	Hird, Dawson, and Hardy.
29	North Cliff	"	Shipley Fire Clay Company.
30	Rockwell	"	Smith and Company.
31	Scholes	"	Hird, Dawson, and Hardy.
32	Seventeens (Clifton)	"	Bowling Iron Company.
33	Shelf	"	Hird, Dawson, and Hardy.
34	"	"	Bowling Iron Company.
35	Shipley	"	Airedale Brick and Tube Company.
36	Shipley Moor	"	William Frith.
37	Smedles (Bowling)	"	John Crowther.
38	Thornton	"	William Illingworth.
39	"	"	Wood and Son.
40	" Road	"	Charles North.
41	Tong Street	"	E. Gittins.
42	Tong	"	Hird, Dawson, and Hardy.
43	"	"	Bowling Iron Company.
44	"	"	S. Broadbent.
45	Wibsey	"	Charles North.
46	Wike	"	Hird, Dawson, and Hardy.
1	Babes in the Wood	Dewsbury	Crawshaw and Blakeley.
2	Batley	"	James Critchley.
3	Beggarington (Hartshead)	"	E. Crowther and Company.
4	Bunkers Hill (Whitley)	"	Jessop, Hallas, and Pindlesden.
5	Calder (Mirfield)	"	Charles Wheatley.
6	Chickenley Heath	"	Crawshaw, Blakeley, and Company.
7	Combs (Thornhill)	"	Capt. Joshua C. Ingram.
8	Cross Bank (Batley)	"	John Holliday and Brothers.
9	Dewsbury Bank	"	Crawshaw and Blakeley.
10	Dewsbury Moor	"	Wroe and Company.
11	"	"	Messrs. Haigh.
12	Dogloach	"	Crawshaw and Blakeley.
13	Falhouse (Whitley)	"	Joseph Bedford.
14	Gregory Spring (Mirfield)	"	J. Sheard.
15	Hartshead	"	Hird, Dawson, and Hardy.
16	Heeley (Briestfield)	"	Hamath Fell.
17	Hagg Wood	"	Charles Wheatley.
18	Hopton	"	Joseph Sheard.
19	Hostingley (Thornhill)	"	Capt. Joshua C. Ingham.
20	Ings (Thornhill)	"	" "
21	Lane Dyehouse	"	J. Whitley.
22	Ledgard Bridge (Mirfield)	"	Charles Wheatley.
23	Liversidge	"	David Wroe and Company.
24	Mirfield Moor	"	Messrs. Marriott.
25	Northorpe (Mirfield)	"	Benjamin Barraclough.
26	Park Farm	"	Park Coal Company.
27	Ravens Lodge	"	Messrs. Haigh.
28	Soothill	"	Crawshaw and Company.
29	Upper Crossley	"	Benjamin Barraclough.
30	Warren House	"	Messrs. Walker.
31	Whitley Wood	"	Charles Wheatley.
1	Alderscholes (Thornton)	Halifax	Michael Pearson.
2	Bank Bottom	"	W. H. Rawson.
3	Binns Bottom	"	Hebblethwaite and Company.
4	Brackens Lane End (Shelf)	"	Topham and Company.
5	Bradshaw Lane	"	Spencer and Company.
6	Crooked Lane	"	Michael Stocks.
7	Dickey Steel (Elland)	"	Henry Hawkyard.
8	Elland	"	Robinson and Company.
9	Four Lane End, Shibden Dale	"	John Cawthrae.
10	Harp Bottom (Queensbury)	"	Joseph Metcalfe and Company.
11	Highfield	"	Holmes and Holt.
12	Lightcliffe	"	Barraclough and Sons.
13	Lime House	"	Holt and Company.
14	Lower Shibden	"	John Lister.
15	Mountain End	"	Foster and Son.
16	Peep Green	"	Sheard and Company.
17	Quarry House	"	Holmes and Company.
18	Queensbury	"	Joseph Briggs and Sons.

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No.	Name of Colliery.	Where situated.	Owner's Name.
19	Rooks (Hipperholme)	Halifax	Tordoff and Sons.
20	Shaw Lane	"	Michael Stocks
21	Shibden	"	Holmes and Company.
22	" Hall	"	John Lister.
23	Shipley Moor	"	Briggs and Sons.
24	Shugden	"	Michael Stocks.
25	Shugden Head	"	T. S. Walsh.
26	Soil Hill (Ovenden)	"	Lassey and Company.
27	Swan Bank	"	Swan Bank Coal Brick Works Company.
28	Thornton	"	Briggs and Sons.
1	Box Ings	Huddersfield	Seth Senior and Sons.
2	Bradley	"	Charles Wheatley.
3	Brockholes	"	Messrs. Haigh.
4	California (Shelley)	"	Matthews and Company.
5	Clayton Common (Clayton West)	"	Norton, Brothers, and Company.
6	Cowmes	"	J. Sheard.
7	Cumberworth	"	Abel and John Addy.
8	Duke Wood (Clayton West)	"	Norton Brothers and Company.
9	Fieldhouse	"	Edward Brooke.
10	Grimescar	"	Jones and Waterhouse.
11	Helm	"	Charles Wheatley.
12	Hollinghouse	"	Messrs. Haigh.
13	Kirkheaton	"	Messrs. Cardwell.
14	Kirk Style (Cumberworth)	"	Henry Ellis and Company.
15	Linfit	"	Hey and Carter.
16	Lockwood Common	"	Executors of James Whitley.
17	New Ground	"	" "
18	Pease Close	"	J. Sheard.
19	Redhill (Shelley)	"	Matthews and Company.
20	Rowley	"	J. Sheard.
21	Shelley	"	Copley and Company.
22	Sinking Wood	"	Messrs. Haigh.
23	Taylor Hill	"	Executors of James Whitley.
24	Toppit (Clayton West)	"	John Hargrave and Company.
25	Whitley (Kirkheaton)	"	Messrs. Cardwell.
26	Wood	"	Messrs. Haigh.
1	Barnside (Hepworth)	Holmfirth	Hirst and Lockwood.
2	Brickworks	"	Uriah Tinker.
3	Carr Wood (New Mills)	"	Charles Lockwood.
4	Foxhouse	"	Mrs. Wagstaff.
5	Fulstone (New Mills)	"	Charles Lockwood.
6	Gatehead	"	Uriah Tinker.
7	Hepshaw	"	"
8	Hollin House (New Mills)	"	Hepworth Iron Company.
9	Hepworth	"	—
10	Meltham	"	Uriah Tinker.
11	Thurtonsland	"	John Haigh.
12	Wood	"	Uriah Tinker.
1	Ingleton	Settle	Hunter and Company.
1	Adwalton Moor	Leeds	William Bower and Brothers.
2	Allerton Main	"	Joshua Bower.
3	Astley	"	"
4	Baildon Moor	"	William Midgley.
5	Balaklava (Morley)	"	West Yorkshire Iron and Coal Company.
6	Beeston	"	The Farnley Iron Company.
7	"	"	Harding and Company.
8	"	"	Hird, Dawson, and Hardy.
	Beverley (Armley)	"	W. H. Chapman.
10	Birkhill (Birkenshaw)	"	Messrs. Harrison.
11	Blue Hills Lane (Wortley)	"	Benjamin North.
12	Britannia Main (Adwalton)	"	Barraclough and Company.
13	Brook House (Gomersal)	"	Thomas and John Tattersall.
14	Brown Moor	"	Manston Coal Company.
15	Bushey (Drighlington)	"	Newmarket Coal Company.
16	Calverley	"	Woodhead's Executors.
17	Churwell	"	Knowles and Company.
18	"	"	Harding and Company.
19	"	"	Hird, Dawson, and Hardy.
20	"	"	William Ward.
21	"	"	The Farnley Iron Company.
22	College (Birstal)	"	Rhodes' Executors.
23	Cross Green	"	Bowling Iron Company.
24	Cow Trees (Gomersal)	"	Rhodes' Executors.
25	Dartmouth	"	William Ward.
26	Dean Hall (Morley)	"	Bedford and Company.
27	Doles Wood (Drighlington)	"	Drighlington Coal Company.
28	Dye House (Gomersal)	"	Knowles and Company.
29	Elland Road	"	Messrs. Towler.
30	Ellerby Lane	"	Bowling Iron Company.
31	Farnley	"	The Farnley Iron Company.
32	Farnley Wood	"	A. Rogers and Son.
33	Foxholes (Methley)	"	William Wood.
34	Garforth	"	Garforth Coal Company.
35	Gelderd Road	"	William Ward.
36	Gildersome	"	The Farnley Iron Company.
37	Gildersome Street	"	John Holliday and Brothers.
38	Green Man (Hunslet)	"	Robinson and Company.
39	Greville (Rawden)	"	Smith and Company.
40	Harehills	"	The Farnley Iron Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
41	Holbeck	Leeds	Hird, Dawson, and Hardy.
42	Howden Clough	"	Asquith, Brothers, and Company.
43	Howley Park (Morley)	"	Howley Park Coal Company.
44	Hunslet	"	Hird, Dawson, and Hardy.
45	Killingbeck (York Road)	"	Messrs. Garside.
46	Kippax	"	Locke and Company.
47	Lanes Wood (Gomersal)	"	Samuel Jackson.
48	Little Gomersal	"	Crowther and Company.
49	Lumb Wood	"	Drighlington Coal Company.
50	Manston	"	Manston Coal Company.
51	Manston Lodge	"	"
52	Micklefield	"	"
53	Middleton	"	Tetley and Company.
54	Morley	"	Harding and Company.
55	"	"	The Farnley Iron Company.
56	Morley Main	"	William Ackroyd and Brothers.
57	Muffit Lane	"	Bastow and Crossley.
58	Nethertown	"	W. Gledhill.
59	Neville Hill	"	Norwegian Titanic Iron Company.
60	New Hall (Middleton)	"	Grosvenor and Son.
61	Newmarket (Adwalton)	"	E. C. Taylor.
62	Oakwell	"	William Ackroyd and Company.
63	Osmondthorpe	"	The Farnley Iron Company.
64	Potternewton	"	Farnley Iron Company.
65	Primrose Hill (Liversedge)	"	Thomas Hardy Jackson.
66	Quaker Lane (Liversedge)	"	John Sheard.
67	Robert Town	"	Mann and Company.
68	"	"	Parkin and Company.
69	Robin Hood	"	Messrs. Charlesworth.
70	Rock (York Road)	"	Incrock and Company.
71	Rothwell Haigh	"	Messrs. Charlesworth.
72	Scotland (Gomersal)	"	Messrs. Harrison.
73	Scratch Lane (Gomersal)	"	Messrs. Jackson.
74	Seacroft	"	Manston Coal Company.
75	Smithies (Birstal)	"	Baslow and Crossley.
76	Smithy Hill (Liversedge)	"	Thomas Parkins.
77	Spring Gardens	"	Drighlington Coal Company.
78	Stanley Main (Liversedge)	"	Stanley Coal Company.
79	Strawberry Bank (Liversedge)	"	Liversedge Coal Company.
80	Sykes (Drighlington)	"	Rooles and Dolby.
81	Tanhouse Mill (Liversedge)	"	Tanhouse Mill Company.
82	Toft Shaw Moor	"	Healey and Pettey.
83	Tong Moor	"	"
84	Victoria (Morley)	"	Messrs. Haigh.
85	" (Adwalton)	"	George Ellison.
86	"	"	John Holmes.
87	Waterloo	"	Clay and Company.
88	Waterloo Main	"	John T. Leather.
89	Water Loose (Adwalton)	"	Ellison and Company.
90	Wellington	"	John Jackson and Son.
91	West Yorkshire (Birstal)	"	George Ellison.
92	" (Manston)	"	Manston Coal Company.
93	White Horse (York Road)	"	Messrs. R. and W. Garside.
94	White Lee	"	Bastow and Crossley.
95	Wortley	"	Ingham and Son.
96	"	"	Joseph Cliffe and Son.
97	York Road	"	Robinson and Clayton.
1	Haigh Moor	Normanton	Pope and Pearson.
2	Methley Junction	"	Briggs and Company.
3	St. John's	"	Locke and Company.
4	West Riding	"	Pope and Pearson.
5	Whitwood	"	Henry Briggs, Son, and Company.
1	Berry Moor	Penistone	Messrs. Hinchcliffe.
2	Bullhouse	"	"
3	Crow Edge	"	"
4	Denby Dale	"	Thomas Haigh.
5	Middlecliffe	"	Thomas J. Tinker.
1	Allerton Bywater	Pontefract	Thomas Carter and Company.
2	Featherstone	"	Featherstone Coal Company.
3	Glass Houghton	"	Wilks and Company.
4	Newton Main	"	H. K. Spark.
5	Snydale	"	Rhodes and Company.
6	Wheldale	"	Holt and Company.
1	Aldwark Main	Rotherham	Shaw and Company.
2	Aston	"	George Law.
3	Carhouse	"	Rhodes and Company.
4	Denaby Main	"	Denaby Coal Company.
5	Elsecar	"	Earl Fitzwilliam.
6	Fence (Woodhouse Mill)	"	Fence Coal Company.
7	Grange	"	Chambers and Son.
8	" (Ironstone)	"	"
9	" Lane	"	Goddard and Maughan.
10	Greasbrough Old Park Gate	"	Sellars and Company.
11	Greenfield (Rawmarsh)	"	
12	Holmes	"	Masborough Coal Company.
13	Kilnhurst	"	Messrs. Charlesworth.
14	Kimberworth	"	Beale and Company.
15	Manvers Main	"	Manvers Main Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
16	Park Gate	Rotherham	Earl Fitzwilliam.
17	Rawmarsh	"	J. Knapton.
18	" Albany and Royal Oak	"	Messrs. Charlesworth.
19	Scholes	"	Beale and Company.
20	Thrybergh Hall	"	Messrs. Charlesworth.
21	Tinsley Park	"	Benjamin Huntsman.
22	Warren Vale	"	Messrs. Charlesworth.
23	Waleswood	"	Skinner and Holford.
24	West Melton	"	W. B. Law.
1	Ashes	Saddleworth	Leeses and Company.
1	Beighton	Sheffield	Skinner and Holford.
2	Birley	"	Jeffcock and Dunn.
3	Bracken Moor (Deepcar)	"	John Helliwell.
4	Brightside	"	Unwin and Company.
5	Carbrook	"	Pitsmore Coal Company.
6	Castle	"	Jeffcock and Dunn.
7	Chapeltown	"	J. Platts.
8	Deepcar	"	John Armitage.
9	"	"	Joseph Grayson.
10	"	"	Benjamin Coldwell.
11	Dungworth	"	Haigh and Company.
12	Elder Cliff (Deepcar)	"	Thomas Grayson.
13	Handsworth	"	Benjamin Huntsman.
14	Haywood (Deepcar)	"	John Armitage.
15	Henholmes "	"	"
16	Hunshelf	"	Joseph Jubb.
17	"	"	Thomas Peace.
18	Kiveton Park	"	Carrington and Company.
19	Lee Wood (Thurgoland)	"	Wilcock and Company.
20	Manor	"	Benjamin Huntsman.
21	New Winning	"	" "
22	North Stavely	"	Staveley Coal and Iron Company (Limited).
23	Orgreave	"	Mrs. Sorby.
24	Sheffield	"	Benjamin Huntsman.
25	Sim Hill (Thurgoland)	"	Messrs. Wilcock.
26	Stocksbridge (Deepcar)	"	Samuel Fox and Company.
27	St. David's (Oughtibridge)	"	Russell and Company.
28	Thankersley	"	Newton, Chambers, and Company.
29	Thorncliffe	"	" "
30	Thurgoland	"	George Darwent.
31	Wharncliffe (Oughtibridge)	"	J. Beaumont.
32	" Wood	"	Silver Fire Brick Company.
33	Woodhouse (Handsworth)	"	Herring and Company.
34	Woodthorp	"	John Rhodes.
35	Wortley Silkstone	"	Andrews, Burrows, and Company.
1	Ardsley Fall	Wakefield	Mrs. Ann Hudson.
2	Alverthorpe	"	Messrs. Haigh.
3	Bottom Boat	"	Messrs. Charlesworth.
4	Bretton	"	Messrs. Jaggar.
5	Dewsbury Lane (Ossett)	"	W. Gartsice.
6	Dirtcar	"	Moore and Company.
7	East Ardsley	"	J. Roberts and Company.
8	"	"	East Ardsley Co-operative Coal Company.
9	Embley Moor	"	Messrs. Jagger.
10	" Park	"	Edward Stringer.
11	Emroyd	"	Stansfield and Company.
12	Field Lane	"	George and John Haigh.
13	Flockton	"	Sir J. L. L. Kaye, Bart.
14	"	"	Stansfield and Company.
15	"	"	Lockwood and Company.
16	" (Overton)	"	Beacher and Jarvis.
17	" Moor	"	Messrs. Jagger.
18	Gawthorp (Ossett)	"	Wilson and Company.
19	"	"	George and John Haigh.
20	Grange	"	Sir J. L. L. Kaye, Bart.
21	" Moor	"	Stansfield and Company.
22	" "	"	Lockwood and Stockwell.
23	Hollingthorp	"	Cliff Coal and Fire Clay Company.
24	Hunt Royal (Upper Whitley)	"	John Roberts.
25	Low Laiths	"	J. Roberts and Company.
26	Manor	"	Woodhead and Company.
27	Milnthorp	"	Messrs. Charlesworth.
28	Needle Eye (Denby Grange)	"	Wormald and Eastwood.
29	Newmarket	"	Messrs. Charlesworth.
30	Nostell	"	Charles Winn.
31	Ossett	"	Messrs. Haigh.
32	Park Lane (Ossett)	"	Cliffe and Company.
33	Providence	"	Joseph Marsland.
34	Ravensthorpe	"	Messrs. Haigh.
35	Roundwood	"	Terry, Greaves, and Company.
36	Saint John's	"	Burnley's Executors.
37	Sharlston	"	Pope and Company.
38	Snapethorp	"	William Hargreaves and Company.
39	Stanley	"	Hudson and Company.
40	Star (Netherton)	"	Joseph Rhodes.
41	Stocksmoor	"	Sir J. L. L. Kaye, Bart.
42	Victoria	"	Hudson and Company.
43	West Ardsley	"	J. Roberts and Company.
44	West Field (Ossett)		Joshua Wilby

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No.	Name of Colliery.	Where situated.	Owner's Name.
45	Woodmoor	Wakefield	Messrs. Charlesworth.
46	Wrenthorp	"	Daniel Micklethwaite and Company.
47	Winney Moor	"	Hargreaves, Hargreaves, and Naylor.

DERBYSHIRE.

H. M. Inspector, THOMAS EVANS, Belper.

1	Alton	Chesterfield	Jackson and Company.
2	Apperknowle	"	G. Wright.
3	Avenue	"	Wingerworth Coal Company.
4	Barlborough	"	M. Barber.
5	" Park	"	Geo. and Jos. Wells.
6	Bird Holme	"	Wingerworth Iron Company.
7	Birley Vale	"	Dunn and Jeffcock.
8	Boythorpe	"	G. Hoskin.
9	" Lane	"	Mrs. H. Ludlam.
10	Brambly Moor	"	Wells and Company.
11	Brampton New Colliery	"	Jackson and Company.
12	Brimington	"	Stephen Sayer.
13	Clay Cross	"	Sir W. Jackson and Company.
14	"	"	E. Phillips.
15	"	"	Thomas Holdsworth.
16	"	"	Coal Aston Company, Limited.
17	Coal Aston	"	James Rhodes and Son.
18	Cottam, Old	"	Appleby and Company.
19	" New	"	" "
20	Dunstone	"	S. Lankester.
21	"	"	George Senior.
22	Eckington	"	Geo. and Jos. Wells.
23	"	"	John Rhodes.
24	Falls Wood	"	Andrew and W. T. Badger.
25	Foxley Oaks	"	Whittington Coal Company, Limited.
26	Grassmoor	"	Messrs. Barnes.
27	Hasland	"	George Senior.
28	Hollingwood	"	Staveley Coal and Iron Company, Limited.
29	Holmwoode Heath	"	Wingermouth Company.
30	Killamarsh	"	T. Ward.
31	"	"	Sheepbridge Iron Company.
32	"	"	Webster and Company.
33	Monk Wood	"	Monk Wood Company, Limited.
34	Moore Hall	"	Jos. and Geo. Wells.
35	Morton	"	W. Jackson and Company.
36	"	"	Jos. and Geo. Wells.
37	"	"	L. Worrall.
38	Nesfield	"	Sheepbridge Coal and Iron Company.
39	Newbold	"	Messrs. Nadin and Pearson.
40	"	"	J. C. Plevins.
41	New Tapton	"	Messrs. Booth and Company.
42	Newbold	"	E. Taylor.
43	New Hollingwood	"	Staveley Coal and Iron Company, Limited.
44	North Wingfield	"	Wm. Jackson and Company.
45	Norwood	"	Sheepbridge Iron Company.
46	Old Cotes	"	Messrs. Galloway.
47	Oxclose	"	Edward Knight and Company.
48	Pilsley	"	Holdsworth.
49	Renishaw	"	Appleby and Company.
50	"	"	Charles S. Appleby.
51	" Park	"	Jos. and Geo. Wells.
52	Sheepbridge	"	Sheepbridge Coal and Iron Company, Limited.
53	Snape Hill	"	Messrs. S. Lucas and Sons.
54	Springfield Main	"	Limited Company.
55	Speedwell	"	Staveley Coal and Iron Company, Limited.
56	Springwell	"	" " "
57	Sutton	"	Executors of Robert Arkwright.
58	Stubley	"	Messrs. S. Lucas and Sons.
59	Tapton	"	Sayers and Company.
60	Unstone	"	H. Rangley.
61	"	"	Bainbridge and Company.
62	Walton	"	George Hewitt.
63	"	"	Oldfield and Company.
64	West Stavely	"	Bainbridge and Company.
65	William Thorpe	"	Wingerworth Coal Company.
66	Woodhouse Lane	"	J. H. Gosling.
67	Woodhouse	"	William Booker and Company.
68	Berrister Lane	Alfreton	C. Seely and Company.
69	Brands', Hard Coal	"	Butterley Company.
70	" Soft Coal	"	" "
71	Butterley Park	"	" "
72	Carnfield, Hard Coal	"	Coke and Company.
73	" Soft Coal	"	" "
74	Coates Park	"	C. Seeley and Company.
75	"	"	J. Oakes and Company.
76	Codner Park	"	Butterley Company.
77	Forty Horse	"	" "
78	Highfield	"	Oakerthorpe Iron Company, Limited.
79	Hartshay	"	Butterley Company.
80	Langley	"	" "
81	Langton	"	Coke and Company.
82	Loscoe	"	Butterley Company.
83	Newlands	"	" "
84	New Main	"	" "

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No.	Name of Colliery.	Where situated.	Owner's Name.
85	Oakerthorpe	Alfreton	Oakerthorpe Iron Company, Limited.
86	Pinxton	"	Coke and Company.
87	Pyebridge	"	James Oakes and Company.
88	Riddings	"	" "
89	Ripley	"	Butterley Company.
90	Shirland	"	Shirland Colliery Company.
91	South Normanton	"	Joseph Swann.
92	Sleights	"	Coke and Company.
93	Swanwick	"	C. R. P. Morewood.
94	Tibshelf, Old	"	Edward Chambers.
95	" New	"	" "
96	"	"	J. Moseley.
97	" Blackshale	"	C. Seeley and Company.
98	Upper Birchwood	"	Butterley Company.
99	Denby, Old	Ripley	W. D. Lowe.
100	" New	"	"
101	Denby Iron Works	"	G. and W. Hope Dawes.
102	Kilburn	"	Executors of J. Ray.
103	Marehay	"	Butterley Company.
104	Morley Park	"	Disney.
105	Pentrich	"	Wm. C. Haslam.
106	Whiteley	"	Butterley Company.
107	Warngroves	"	" "
108	Awsworth	Ilkeston	Digby Coal Company.
109	Bennerley	"	F. C. Gillatt.
110	Cotmanhay	"	Barber, Walker, and Company.
111	Granby	"	Butterley Company.
112	Heanor	"	J. Eley.
113	"	"	Bircumshaw and Company.
114	"	"	J. Argyle.
115	"	"	J. Prince.
116	Rutland	"	Executors of Potter.
117	Shipley, Soft Coal	"	Alfred M. Mundy.
118	" Hard Coal	"	" "
119	Stoneyford, Old	"	J. Wooley.
120	West Hallam	"	H. B. Whitehouse and Son.
121	"	"	Lieut.-Col. Newdegate.
122	Bretby	Burton-on-Trent	The Earl of Chesterfield.
123	Cadley Hill	"	Hall and Boardman.
124	Church Gresley	"	Abney Hastings.
125	Coton Park	"	Binns, Jackson, and Company.
126	Granville	"	Executors of the late Court Grenville.
127	Gresley Wood	"	Hall and Boardman.
128	Old Swadlincote	"	Church and Company.
129	Stanton	"	Messrs. Nadin.
130	Swadlincote	"	Hall and Boardman.
131	Woodfield or Newhall	"	Messrs. Nadin.
132	Axe Edge	Buxton	The Buxton Lime Company.
133	Beard and Bagsworth	"	Hall.
134	Burn'd Edge	"	L. and E. Hall.
135	Chisworth	Glossop	J. Jowitt.
136	Compstall	Stockport	Messrs. Andrews and Son.
137	Laneside	"	Messrs. Hadfield.
138	New Mills	"	J. Jowitt.
139	Thornsett	"	T. and J. Bennett.
140	Whaley Bridge	Whaley Bridge, Stockport	Buxton Lime Company.

NOTTINGHAMSHIRE.

H.M. Inspector, THOMAS EVANS, Belper.

1	Annesley	Mansfield	W. Worswick.
2	Awsworth	"	F. C. Gillatt.
3	Beau Vale	East Wood	Barber, Walker, and Company.
4	Beggar Lee	"	" "
5	Brinsley	"	" "
6	Cinder Hill	Nottingham	J. Wright.
7	Cotmanhay	East Wood	Barber, Walker, and Company.
8	Dgby	"	Hall and Company.
9	Eist Wood	"	Barber, Walker, and Company.
10	Gait Brook	Nottingham	Hicks and Company.
11	Hiigh Park	"	Barber, Walker, and Company.
12	Hill Top	"	"
13	Hucknal Torkard, No. 1	"	Ellis and Company.
14	" " No. 2	"	" "
15	Kimberley	"	J. Wright.
16	Mexbro'	Mansfield	Butterley Company.
17	Molineux	"	Eastwood and Swingler.
18	Newcastle	Nottingham	J. Wright.
19	Plumtree	Eastwood	Butterley Company.
20	Portland	Mansfield	"
21	Shire Oaks	Worksop	Shire Oaks Colliery Company.
22	Skegby	Mansfield	Skegby Colliery Lime and Brick Company.
23	Teversall, No. 1	"	Stanton Iron Company.
24	" No. 2		
25	Underwood	East Wood	Barber, Walker, and Company.
26	Watnall	"	"

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No.	Name of Colliery.	Where situated.	Owner's Name.
	WARWICKSHIRE.		
	H.M. Inspector, THOMAS EVANS, Belper.		
1	Baddesley	Atherstone	W. S. Dugdale.
2	Bedworth Charity	Coventry	Addenbrooks and Pidcock.
3	Craven	„	W. S. and J. Harris.
4	Glascote	Tamworth	Firmstone and Company.
5	Griff	Nuneaton	C. N. Newdegate, M.P.
6	Haunch Wood	„	Nowell and Son.
7	Hawkesbury	Bedworth	James Darlington and Company.
8	Hockley Hall	Tamworth	J. E. Swindels.
9	Kettlebrook	„	Executors of T. Dumulo.
10	Nuneaton	Nuneaton	Limited Company.
11	Polesworth	Tamworth	Morris and Shaw.
12	Peel	„	G. Skey.
13	Tame Valley	Tame Valley	Knox.
14	Victoria	Coventry	T. Troughton.
15	Wilnecote	Tamworth	Perrins and Harrison.
16	Wykin	Coventry	Wykin Coal Company.
	LEICESTERSHIRE.		
	H.M. Inspector, THOMAS EVANS, Belper.		
1	Bagworth	Leicester	Executors of Viscount Maynard.
2	Coleorton	Ashby-de-la-Zouch	Walker and Worswick.
3	Ibstock	Leicester	Executors of J. Whetstone.
4	Moira	Ashby-de-la-Zouch	Abney Hastings.
5	„ New	„	„
6	Nailstone	Bagworth	Joseph J. Ellis.
7	Oakthorpe	Ashby-de-la-Zouch	Abney Hastings.
8	Snibston	Leicester	G. R. Stephenson and Company.
9	Swannington	Ashby-de-la-Zouch	W. Worswick.
10	Whitwick	Leicester	W. Whetstone.
	NORTH STAFFORDSHIRE.		
	H.M. Inspector, THOMAS WYNNE, Stone.		
1	Callow Hill	Cheadle	Plant and Company.
2	Cheadle	„	Cheadle Coal Company.
3	Dilhorne	„	Joseph Salt and Company.
4	Draycott Cross	„	Jno. Keys.
5	Ipstones	„	Plant and Company.
6	Lady's Well	„	Wm. Bowers.
7	Woodhead	„	„
1	Adderley Green	Longton	Stirrup and Company.
2	Bentilee	„	Hawley and Bridgwood.
3	Berry Hill	„	Wm. Bowers.
4	Botteslow	„	F. E. Pratt.
5	Cinder Hill	„	Charles Leighton.
6	Fenton Park	„	Fenton Park Coal and Iron Company (Limited.)
7	Foley	„	Goddard and Sons.
8	Glebe	„	Challinor and Company.
9	Golden Hill	„	Goddard and Company.
10	Hall Hill	„	Hawley and Company.
11	Holly Bush	„	Wm. Bowers.
12	Hulme	„	J. Waine.
13	Hulme Bank	„	Stirrup and Company.
14	Longton Hall	„	James and Alfred Glover.
15	Ubberley	„	John Harp.
16	Millfield Gate.	„	W. H. Sparrow and Son.
17	Moss Fields	„	Hawley and Bridgwood.
18	Old Field	„	Goddard and Sons.
19	Anchor	„	Ashwell and Company.
20	The Lawn	„	Hawley and Company.
21	Ubberley	„	John Harp.
1	Bells Mill	Hanley	Earl Granville.
2	Brook House	„	F. E. Pratt.
3	Bucknall	„	Hanley and Bucknall Coal Company.
4	„	„	Sales, Heath, and Sales.
5	Bucknall, New	„	W. F. Gordon.
6	Collamoor	„	J. Gerrard.
7	Eaves	„	Simpson and Company.
8	Far Green	„	Earl Granville.
9	Ivy House and Northwood	„	Ivy House and Northwood Mining Company (Limited)
10	„ „	„	Rigby and Company.
11	Lady Well	„	Earl Granville.
1	Bank Top	Burselm	James Stott and Company.
2	Boothen	„	Samuel Fox.
3	Chatterley	„	Chatterley Iron Company.
4	Chell	„	Estate of H. H. Williamson.
5	Cobridge	„	Edward Pearson.
6	Ford Green	„	Robert Heath.
7	High Lane	„	Stott and Company.
8	Hamill and Bycars	„	John Wedgwood, Representatives of.

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No.	Name of Colliery.	Where situated.	Owner's Name.
9	Jackfield	Burslem	Thos. Plant and Company.
10	Norton	"	Robert Heath.
11	Norton Court	"	"
12	Sandbach	"	Cochrane and Swindell.
13	Sneyd Farm	"	C. B. May and Company.
14	"	"	F. Stannier.
15	Stanfields	"	Heath and Norris.
16	Sylvester	"	Barnett and Company.
17	Sytch Cross	"	Thomas Wood.
18	The Bycars	"	John Wedgwood, Representatives of.
1	Chell	Tunstall	R. Beswick and Company.
2	Clanway	"	Henry Clive and Sons.
3	Furlong	"	Josh. Heath, Representatives of.
4	Golden Hill	"	Williamson Brothers.
5	Green Fields	"	Wm. Adams.
6	Green Gates	"	H. Meir.
7	Lowlands	"	Williamson Brothers.
8	Newfield	"	Wm. Adams.
9	"	"	Tunstall Coal and Iron Company.
10	Oxford	"	R. Beswick.
11	Ridgway and Chill	"	Estate of H. H. Williamson.
12	Thursfield	"	A. Roberts.
13	Turnhurst	"	Fred. and Howard Bankhart.
14	Wedgwood	"	Whitfield Colliery Company.
15	Yold Hill	"	Williamson Brothers.
1	Biddulph	Biddulph	Robert Heath.
2	Bradley Green	"	Leigh and Bradbury.
3	Childerplay	"	Robert Heath.
4	Mow Cop	"	Viggars and Company.
5	Oxhay	"	Heath and Company.
6	Park Farm	"	G. Gaskell.
7	Ranscliff	"	Kinnersley and Company.
8	Stonetrough	"	Williamson Brothers.
9	Trubshaw	"	Bidder and Elliot.
10	"	"	Kinnersley and Company.
1	Apedale	Newcastle-under-Lyne	Apedale Iron Company.
2	Audley	"	Rigby and Company.
3	Bignall End	"	N. P. Wood.
4	Bunkers Hill	"	Rigby and Company.
5	Clough Hall	"	Kinnersley and Company.
6	Greenfield	"	Talke Coal Company.
7	High Carr	"	J. H. Williamson (Ironstone).
8	Hollinwood	"	Kinnersley and Company.
9	Kidsgrove	"	" "
10	Knutton	"	Wm. F. Gordon.
11	Knutton Farm	"	Jos. Heath, Representatives of.
12	"	"	Viggars and Company.
13	Lawton	"	Bidder and Elliott.
14	Lycett	"	Rigby and Company.
15	Madeley and Leycett	"	Crewe Coal and Iron Company (Limited).
16	Millbank	"	J. H. Pearson.
17	Mitchell's Wood	"	Talke Coal Company.
18	Podmore Hall	"	Rigby and Company.
19	"	"	Cooper and Company.
20	Silverdale	"	F. Stannier and Company.
21	Talk Lanes	"	Talke Coal Company.
22	The Nabs	"	F. Stannier and Company.
23	White Barn (Ironstone)	"	W. Lawton and Company.
24	Woodshuts	"	Cooper and Company.

SOUTH STAFFORDSHIRE.—WORCESTERSHIRE.

H.M. Inspector, JAMES P. BAKER, Wolverhampton.*

1	Brereton	Rugeley	Earl of Shrewsbury and Talbot.
2	Cannock and Rugeley	"	Cannock and Rugeley Colliery Company.
3	" Chase	"	J. R. McLean and Company.
4	The Hayes	"	Earl of Shrewsbury and Talbot.
5	Hednesford	"	Pigott and Company.
1	Brownsfield	Wyrley	Bernard Gilpin.
2	Cathedral	"	W. Harrison.
	Cheslyn Hay, New	"	F. Gilpin.
3	Conduit	"	The Conduit Colliery Company.
4	Hatherton	"	B. Gilpin.
	Landy Wood	"	William Thomas.
	Long House	"	Lord Hatherton.
5	New Brownhills	"	Conduit Colliery Company.
6	Old "	"	Wm. Harrison.
7	"	"	J. Owen.
8	Old Coppice	"	J. Hawkins.
9	Old Falls	"	"
	Poynors	"	Exors. of H. Poynor.
	Rugeley School	"	B. Gilpin.
10	Sayers Colliery	"	C. Quinton.
	Sling	"	E. Sayer.
11	Wyrley	"	Wyrley Cannock Company.

* The collieries numbered are those which were working in 1869.

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No.	Name of Colliery.	Where situated.	Owner's Name.
12	Wyrley Town	Wyrley	T. Bantock.
	„ New	„	G. Bird.
	„	„	F. Gilpin.
1	Ash Field	Walsall	Messrs. Bloomer.
2	Bentley	„	Barker and Company.
	„ Bridge	„	R. Thomas.
3	„ Park	„	Jno. Bagnall and Sons.
4	Beech Dale	„	D. Davis and Company.
5	Birchills	„	Various.
	„ Old	„	Hunt and Company.
	„ Union	„	Exors. of John Stubbs.
	Bloxwich	„	John Brayford.
	„	„	W. Birch.
6	Camhay	„	J. Brayford.
7	Station	„	J. Lindop and Co.
8	Clangaer	„	W. Harrison.
	Coal Pool	„	Exors. of J. Stubbs.
9	Copy Hall	„	J. Williams and Company.
10	Croxstalls	„	J. Smallman.
11	Deep Moor	„	Bagnall and Company.
	Essington Snead Lane	„	Wm. Pedley.
12	Fishley	„	W. H. Sparrow and Company.
	Four Crosses	„	Thomas Checkley.
	Farm	„	Deeley and Dulston.
13	Goscote Hall	„	G. B. Cale and Company.
	Green Lane	„	John Jones.
	„	„	T. and C. Highway.
14	Goscote	„	C. Smith.
15	Harden	„	T. Checkley and Company.
16	„	„	E. Crapper.
17	„	„	W. H. Sparrow and Company.
18	Hatherton	„	Messrs. Thomas.
19	Horse and Jockey	„	Mainwaring and Company.
20	Leamore Bridge	„	Charles Rowley.
21	Moat	„	W. Hanbury.
22	New Field	„	Bagnall and Company.
23	New Invention	„	J. Brewer.
24	Norton Green Colliery	„	Conduit Colliery Company.
	Park Brook	„	John Bagnall and Sons.
25	Pelsall	„	B. Gilpin.
26	„ Hall	„	Pearson and Company.
27	„ Common	„	Bloomer and Sons.
28	„ Wood	„	„ „
29	Reed's Wood	„	Various.
30	Rough Wood	„	Charles Perry.
31	Russian	„	J. Mason.
	Rycroft	„	S. Smith.
	Ryder's Hays	„	W. Harrison.
	Short Heath	„	Smallman Brothers.
32	Snead Lane	„	Caddick and Company.
33	„	„	Jas. Smallman.
34	„	„	Bloomer and Sons.
35	Sneyd	„	Dutson and Company.
36	„ Turn	„	Johnson and Grey.
37	The Charity	„	Williams Brothers.
38	The Manor	„	Richard Thomas.
39	Wall End	„	Edwd. Milner.
	„ New	„	E. Milner.
	„ Bloxwich	„	Rd. Thomas.
40	Ward	„	J. Bagnall and Company.
41	Wood Farm	„	Jeavons and Mitchell.
42	„ Well	„	Messrs. Bloomer and Son.
1	Albert	Darlaston	David Rose.
2	Bescot	„	Darlaston Steel and Iron Company.
	Darlaston Green	„	„ „
3	„	„	James Sanders.
	„	„	Geo. Oates.
4	Green's Farm	„	Green's Farm Colliery Company.
5	Herbert's Park	„	David Jones.
6	James Bridge	„	J. Bagnall and Sons.
7	North-western	„	J. Simpson.
8	Rough Hay	„	Addenbrooke and Company.
9	Victoria	„	John Dutson.
	Bank	Bilston	J. Yardley and Company, in Darlaston.
	Bankfield	„	Groucott and Sons.
1	Barbor's Field	„	Barbor's Field Company.
2	Batman's Hill	„	Williams Brothers.
3	Barn Farm	„	Various.
	Bilston	„	Johnson and Company.
	„ New	„	P. Williams and Sons.
	Bovereux	„	W. Baldwin and Company.
4	Bradley	„	Thornycroft and Company.
5	„ Lodge	„	Hawkins and Millington.
6	„	„	Bagnall and Company.
	„	„	B. Gibbons, jun.
	Broadwaters	„	J. Bagnall and Sons.
	Buggins Lane	„	F. Lane.
	Bunker's Hill	„	Firmstone and Company.
	„	„	W. Shale.

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No.	Name of Colliery.	Where situated.	Owner's Name.
	Bunker's Hill	Bilston	W. Shale.
7	"	"	Barker and Company.
8	Brierley	"	J. Yardley.
9	Capponfield	"	Jno. Bagnall and Sons.
10	"	"	Barker and Company.
11	Cold Lanes	"	M. Frost and Company.
12	Deepfields	"	P. Williams and Sons.
13	"	"	Bantock and Company.
14	Ettingshall Lodge	"	Harper and Company.
	"	"	W. Banks.
	"	"	W. Smith.
15	Fullwood's End	"	J. and T. Turley.
	Greaves	"	Exors. of T. and J. Badger.
16	Hall Park	"	Various.
	Havacre	"	B. Gibbons.
17	Highfield	"	Fowler and Company.
18	Hincks	"	Cadman and Company.
	Hitchens	"	Groucott and Sons.
	Holyhead Road	"	John Bate.
19	Hoo Marsh	"	Various.
20	Kempson	"	Harper and Company.
	Kitsfield	"	Kitsfield Company.
21	Ladymoor	"	T. Holcroft.
	Lunt	"	Dodd and Southan.
	"	"	T. Lester and Company.
22	Mabb's Bank	"	Williams Brothers.
23	Meadows	"	W. Bradburn.
	"	"	Williams Brothers.
	Middlefield	"	Wm. Shale.
	Millfield	"	J. Sparrow.
	Moorcroft, Old	"	D. Skidmore.
24	Moseley Hole	"	W. H. Sparrow and Company.
	"	"	Edwards and Company.
	Mount Pleasant	"	H. and A Hickman.
25	Moxley	"	Groucott and Sons.
	Page's Croft	"	A. Wright.
26	Priestfield	"	Wm. Ward and Sons.
27	Priorfield	"	H. B. Whitehouse.
28	Proud Lane	"	T. Roper and Company.
29	Quarry	"	W. H. Sparrow and Company.
	"	"	Geo. Jones.
30	"	"	J. Hickman.
	Rookery	"	Geo. Jones.
	"	"	Various.
31	"	"	G. Bloomer and Company.
32	Spring Vale	"	Harper and Bantock.
	Stonefield	"	H. and A. Hickman.
	Todmoor	"	T. Holcroft.
33	Toll Gate	"	B. Gibbons.
	Union Street	"	Job Hickman.
	Wall Butts	"	W. Baldwin and other Proprietors.
	Yew Tree	"	Messrs. Turley.
1	Albion	Willenhall	Harper and Company.
2	Anson	"	Earl of Lichfield.
	Barr Croft	"	J. Hill and Company.
3	Bomans Harbour	"	H. B. Whitehouse.
	Boltoney Bay	"	J. Yardley and Company.
4	Bull Pleck	"	Messrs. Groucutt.
	Coppice	"	J. Bagnall and Sons.
5	Crescent	"	" "
6	"	"	Addenbrook and Company.
	Lane Head	"	W. Mannix and Bate.
7	" Bridge	"	Joseph Hawkins.
	Little London	"	Trentham Colliery Company.
	Moat Field	"	Dodd and Southan.
8	Moseley Hole	"	Chillington Company and others.
9	Neachells	"	Messrs. Groucutt.
10	"	"	H. B. Whitehouse.
11	"	"	John Sparrow.
	"	"	Barbersfield Company.
12	" New	"	P. Williams and Company.
13	New Cross	"	H. B. Whitehouse.
	Nimmins	"	Dodd and Southan.
	Noose Lane	"	Bate and Son.
14	Pool Hayes	"	Messrs. Fenn.
15	" Meadow	"	Chillington Company.
16	Porto Bello	"	H. Ward.
	" Bridge	"	Fletcher, Solly, and Urwick.
	" " New	"	" "
17	Priestfields, New	"	Wm. Ward and Son.
	Robbin Hood	"	J. Simpkin.
18	Rose Hill	"	Chillington Company.
19	"	"	Brown and Spittle.
	Sand Beds	"	Fletcher, Solly, and Urwick.
20	Somerford	"	Messrs. Barker.
21	Tame Mill	"	Johnson and Company.
22	Trentham	"	Isaiah Hill and Company.
	Welsh End	"	" "
23	Willenhall	"	Wm. Ward and Sons.
24	"	"	John Yardley.

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No.	Name of Colliery.	Where situated.	Owner's Name.
	Bridge	Wolverhampton	L. Lloyd.
	Buggins Lane	,,	P. Williams and Company.
	,,	,,	Creditors of Whitehouse and Poole.
1	Chillington	,,	Foster, Jones, and Barker.
	,,	,,	George Jones.
2	Cleveland	,,	Exors. of John Hill.
3	Cockshutts	,,	Aston and Shaw.
4	Essington Wood	,,	Darlaston Iron and Steel Company.
5	Ettingshall (Blackenhall)	,,	J. Cadman.
6	,,	,,	Henry Hill.
7	Frost's Field	,,	M. Frost and Company.
	Lock House	,,	Aston and Company.
8	Monmore Green	,,	Corbett and Hartshorne.
9	Osier Bed	,,	W. and J. J. Sparrow and Company.
10	Parkfield	,,	Parkfield Company.
11	Peascroft	,,	W. and J. J. Sparrow and Company.
12	Rough Hills	,,	Aston and Shaw.
13	,,	,,	James Cadman.
14	Stow Heath	,,	W. and J. J. Sparrow and Company.
15	Wednesfield	Wolverhampton	W. F. Fryer.
16	,,	,,	J. Round.
17	Wednesfield Heath	,,	H. Caswell and Company.
	,,	,,	New British Iron Company.
18	New Deans	,,	W. F. Fryer.
19	Willenhall Road	,,	J. Edge and Company.
20	Wolverhampton	,,	Aston and Shaw.
1	Battyfield	Sedgeley	T. Pemberton.
	Caponfield	,,	Bagnall and Sons.
	Cow Lane	,,	T. H. Pemberton.
	Cooper's Bank	,,	Oakes and Company.
	,,	,,	Smith and Taylor.
	,,	,,	William Perry.
2	,,	,,	Thomas Webb.
	Ettingshall, New	,,	Smith and Guy.
3	Graveyard	,,	Messrs. Hughes.
4	Hockley	,,	Benjamin Johnson.
	Priory Field	,,	Wade and Hampton.
5	Riddings	,,	T. H. Pemberton.
6	Sedgeley Park	,,	S. Cole and Company.
	,,	,,	Messrs. Perry.
	Spring Vale	,,	Bagnall and Sons.
	,,	,,	W. T. Smith.
	Woodsetton	,,	Thomas King.
7	,,	,,	Z. Mason.
	Ash Meadows	Tipton	Williams and Whitehouse.
1	Bloomfield Colliery	,,	Fowler and Company.
2	Coneygre	,,	Earl of Dudley.
3	Cop Hall	,,	Messrs. Bagnall.
4	Cotterill's Farm	,,	Darlaston Steel and Iron Company.
	Denbigh Hall	,,	Denbigh Hall Company.
	,,	,,	J. and E. Nocks.
	Doe Bank	,,	Jas. Bagnall and Sons.
	Dudley Port	,,	Amphlett and Bedford.
	,,	,,	Hopkins and Bradley.
	,,	,,	F. Giles.
5	Eagle	,,	J. Cleyton.
	Factory	,,	Welsh and Barrows.
6	Fox Yards	,,	Earl Dudley.
7	Gospel Oak	,,	Grazebrooks and Aston.
8	High Leasows	,,	John Millard.
9	Horsley	,,	Dixon and Company.
	Hurst	,,	Samuel Rowley.
10	Moat	,,	Moat Colliery Company.
11	Monway	,,	Sir H. St. Paul.
	Moors	,,	J. Whitehouse.
	Park Lane	,,	W. Hopkins.
12	,,	,,	J. Colbourn and Sons.
	Princes End	,,	Barbors Field Company.
	Rounds Hill	,,	Earl of Dudley.
13	Tibbington	,,	J. Howl.
14	Tipton	,,	John Colbourn and Sons.
15	,, Green	,,	Various.
	,, Hall	,,	Welch and Barrows.
16	,, Meadow	,,	J. Bailey and Company.
17	Wednesbury Oak	,,	P. Williams and Company.
18	Willingsworth	,,	T. Jones and others.
1	Blackheath	Rowley Regis	W. H. Dawes.
2	Bourne Hill	,,	Nock and Company.
3	Brades	,,	Messrs. Hunt.
4	,, Hall	,,	Wright and North.
5	Burnt Trees	,,	Joseph Aston.
6	Cricket	,,	S. Bennett.
	Gawn	,,	Messrs. Hingley.
	Gorst Hill	,,	Wm. Mills.
7	Grace Mary	,,	S. Minton.
8	Granville	,,	Swindell and Collis.
9	Hall Stone	,,	Wright and Company.
10	Hall Bridge	,,	Hall Bridge Company.
11	Hange	,,	D. and G. Round.

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No.	Name of Colliery.	Where situated.	Owner's Name.
12	Haydon Hill	Rowley Regis	W. Bassano and Company.
13	Hyatts	"	Nock and Company.
14	Manor House	"	J. Dawes.
15	Old Hill	"	James Holcroft.
16	"	"	D. Rose.
17	Portway Hall	"	W. H. Dawes.
18	Ramrod Hall	"	Earl of Dudley.
19	Rattle Chain	"	Job and Henry Haines.
20	Rowley Hall	"	Wright and North.
	Scotwell	"	Stevens and Company.
	Sutherland	"	Hopkins and Bradley.
21	Tividale Hall	"	"
22	" New	"	Bagnall and Jesson.
	"	"	Earl of Dudley.
23	"	"	S. Bradley and Company.
24	"	"	H. B. Whitehouse.
25	Withey Moor	"	W. H. Dawes.
26	"	"	Nock and Company.
1	Albion	Oldbury	Walter Williams.
2	Alston	"	Z. Mason and Company.
	Big Meadow	"	W. Bennett.
3	Birchey Lane	"	Parrish and Lewis.
	Birchey Fields	"	Darbey and Jones.
	Bircheyfield Lane	"	Gregory and Company.
4	Bradley Hall	"	S. Bradley.
	Bromford Lane	"	Johnson and Mason.
	Causeway Green	"	Josh. Hackett.
	Coppice	"	B. Johnson.
	Cutler's End	"	Bennitt and Williams.
	Flash	"	W. Bennitt.
	Grange	"	Parkes and Company.
5	Hillyfield	"	Guest and Company.
	Newbury Lane	"	Bennitt and Taylor.
	"	"	Taylor and Farley.
	Oldbury	"	Josh. Hackett.
	Park Hall	"	Mason and Company.
	Parkhouse Lane	"	John Williams.
	"	"	Collins and Company.
6	Rounds Green	"	Z. Mason and Company.
	"	"	W. Bennitt.
	Rowhay	"	Hopkins and Walton.
	The Holt	"	Harper and Moore.
7	Titford Holt	"	Joseph Bennitt.
	" Bridge	"	H. B. Whitehouse.
8	" Meadow	"	Jas. Hackett.
9	Whimsey	"	Various.
	Springfield	"	S. Rowley and Company.
1	Ball's Hill	West Bromwich	T. Millership.
2	Black Lake	"	B. Whitehouse.
	Bull's Barn	"	Simkiss and Company.
	Church Lane	"	B. Whitehouse.
	" (Oak Tree)	"	"
	Claypit Lane	"	Eagle Company.
	"	"	Homer and Company.
3	Cobbs Barn	"	R. Whitehouse.
4	Coppice	"	John Hartland, jun.
5	"	"	H. Parrish.
6	Crab Tree	"	Bagnall and Sons.
7	"	"	Various.
8	"	"	"
	Cutler's End	"	Williams and Smith.
9	Dunkirk	"	Taylor and Farley.
10	"	"	P. Williams and Sons.
11	" Mill	"	Hartland and Company.
12	Ebenezer	"	B. Whitehouse.
13	Far Close	"	Hawkins and Company.
14	Friar Park	"	W. H. Dawes.
15	Gold's Green	"	J. Bagnall and Sons.
	" Colliery	"	Jno. Nayler.
16	Groveland	"	J. Bagnall and Sons.
17	Greet's Green	"	Jno. Batson.
18	Hall End	"	Parker and Halford.
19	"	"	Harland and Company.
20	Harvill's Hawthorn	"	R. Whitehouse.
21	Hateley Heath	"	T. Millership.
	Heath	"	Earl Dartmouth.
	Ireland Green	"	Parrish and Lewis.
22	"	"	T. Cox and Company.
	"	"	"
23	Jervoise	"	Jno. Tildesley.
24	Keeling	"	H. Wythes.
	Lewisham	"	Earl Dartmouth.
	Lodge	"	"
25	Lyttleton Hall	"	W. H. Dawes.
26	Marsh Lane	"	Jno. Spittle.
27	"	"	J. Simkin.
28	Mill Field	"	T. Millership.
29	Mill Pool	"	Messrs. Millington.
	Mount Pleasant	"	J. Dawes.
30	Moor Lands	"	Bagnall and Sons.

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No.	Name of Colliery.	Where situated.	Owner's Name.
31	New Mine	West Bromwich	Parker and Halford.
	New Whyley	"	J. Percy.
	Old House	"	"
	Oldbury Lane	"	W. Williams.
	Old Whyley	"	J. Percy.
	Piercey	"	T. Cox and Company.
32	Pump House	"	Bagnall and Son.
	Rowhay	"	P. Williams and Company.
	"	"	Haines and Son.
33	Springfield	"	Eagle Coal and Iron Company.
34	Squarefield	"	"
35	Stone Cross	"	J. Spittle.
	Swan Meadow	"	Stourbridge Banking Company.
	Tantany	"	Field and Davis.
36	Union	"	P. Williams and Sons.
37	Victoria	"	W. H. Dawes.
38	Wednesbury New Mine	"	B. Whitehouse.
39	Whitehall	"	J. Kenderick.
40	White's Farm	"	Jno. Spittle.
	Bradley Colliery	Wednesbury	Phillip Williams and Sons.
	Broadwaters	"	J. Bagnall and Sons.
	"	"	Sir H. St. Paul.
1	Doe Bank	"	Haines and Underhill.
	Fallings	"	W. Grove.
	King's Hill	"	Josh. Butler.
	"	"	Samuel Mills.
	"	"	Morris and Bayley.
2	Lea Brook	"	W. Hodgkins.
	Misty Croft	"	Williams and Company
	New Field	"	Botteley and Company
	Oakes Well	"	J. Horton.
3	Ocker Hill	"	Haines and Underhil.
	Old Field	"	R. Morgan.
4	Old Park	"	Lloyds, Forsters, and Company.
5	Potter's Lane	"	W. Hodgkins.
6	Steer's Meadow	"	W. E. Jones.
	Vicarage	"	J. Batson and Company.
	"	"	Tart and Company.
7	Wednesbury Park	"	Lloyd, Foster, and Company.
1	Ash Tree	Corngreaves	James Holcroft.
2	Bear Moor	"	N. B. Iron Company.
3	Black Waggon	"	"
	Blue Bell	"	T. and J. Badger.
4	Cradley Heath	"	Parsons and Cooper.
5	Cradley	"	A. Sparrow.
6	Cradley Park	"	J. King and Company.
7	Corngreaves*	"	N. B. Iron Company.
	Dudley Wood	"	Job Taylor.
8	Eagle	"	William Mills.
	Fidoes Engine	"	Lloyd and Company.
	Fly	"	N. B. Iron Company.
9	Fox Oak	"	Cartwright and Company.
	Garrett's Lane	"	T. and J. Badger.
	Haden Hill	"	Brettel and Company.
10	Hawne	"	N. B. Iron Company.
11	Hawne, New	"	"
12	Hayes	"	Fisher Brothers.
13	Hay Green	"	Messrs. Hickman.
	High Harker	"	H. Barrs.
	"	"	Jno. Hall.
14	Homer Hill	"	S. Evers and Sons.
15	Knowle	"	T. Jones and Company.
16	Lion	"	N. B. Iron Company.
	Lloydsfield	"	Purser.
17	Lye, Hungary Hill and New Farm	"	F. T. Rufford.
	Misty Croft	"	Tart and Company.
	Netherend	"	Josh. King.
18	"	"	"
	"	"	Perrens and Company.
	Oakswell End	"	Kendrick and Company.
19	Redall	"	Hingley and Sons.
20	Riddings	"	Waldron and Company.
21	Saltwell	"	Earl of Dudley.
	Shepheard's Brook	"	Messrs. Eveson.
	Tandys	"	T. and J. Evans.
	Waterfall Lane	"	Wm. Mills.
22	Whitehall	"	George Dudley.
1	Baptist End	"	Thos. Crew.
2	"	"	Messrs. Dunn.
	Barrow Hill	"	Earl of Dudley.
	Bird Leasows	"	Richard Mills.
3	"	"	Robinson and Jones.
	Blakemoor	"	N. B. Iron Company.
	"	"	J. Ray.
4	Blower's Green	Dudley	Brettel and Cartwright.
5	"	"	Messrs. Grazebrook.
	Brooks	"	B. Gibbons.

* Including part of Hayden Hill.

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No.	Name of Colliery.	Where situated.	Owner's Name.
6	Buffery, Old	Dudley	Thos. Crew and others.
	Buffrey, New	,,	Wm. Haden.
	Common Side	,,	T. and. J. Badger.
7	Corbyn Hall	,,	B. Gibbons.
8	Court House	,,	,,
	Culling	,,	Mrs. Davis.
	,,	,,	Birch and Company.
	Dixon's Green	,,	Knowles and Crew.
	Furnace Field	,,	Joshua Horton.
9	Freemans	,,	B. Gibbons.
	Gornhall Wood	,,	Thos. Taylor.
	Hart's Hill	,,	Plant and Company.
	,,	,,	J. and C. Cochrane.
10	Haughton	,,	B. Gibbons.
11	High Lanes	,,	Blackwell and Company.
	,,	,,	Evers and Martin.
	Holly Hall	,,	,,
12	Hurst	,,	Messrs. Cochrane.
13	Keelings	,,	B. Gibbons.
	Level	,,	Hall, Halcroft, and Pearson.
14	Netherton	,,	N. Hingley and Sons.
15	,,	,,	Messrs. Grazebrook.
16	Oak Farm	,,	W. Walker.
17	,,	,,	Sir Stephen R. Glynne.
18	Old Park	,,	Earl of Dudley.
	Old Level	,,	Hall, Holcroft, and Company.
	Orchard	,,	Earl of Dudley.
19	Parkhead	,,	Evers and Martin.
20	Pensnett	,,	Earl of Dudley.
	Planet	,,	J. Raybould.
21	Prestwood	,,	B. Gibbons.
22	Prince of Wales	,,	J. Taylor and Haines.
23	Queen's Cross	,,	S. Garratt.
24	Russell's Hall	,,	Bradley and Company.
25	Shut End	,,	John Bradley and Company.
26	,, New	,,	A. B. Cochrane and Company.
27	Stallings	,,	F. W. Pierson.
28	Tansey Green	,,	Woodall and Company.
	Tansley Hall	,,	Job Taylor.
29	Wallows	,,	Garrett and Company.
	,,	,,	Earl of Dudley.
30	Widewaters	,,	J. and C. Cochrane.
31	Woodside	,,	Cochrane and Company.
32	Yew Tree	,,	B. Gibbons.
1	Abberley and Pool House Colliery	Stourport	J. Jones.
2	Hollyacre	,,	W. Norwood.
3	Old Hall	N. W. Worcester	Sir Edward Blount, Bart.
4	Pensax	Stourport	Pensax Colliery Company.
1	Amblecote	Brierley Hill	Hill and Company.
2	,,	,,	J. Hall.
	Bank	,,	Matthews and Woodcock.
	Bell-Isle	,,	Fothergill and Company.
	Brettel Lane	,,	Bache and Company.
	,,	,,	Haines and Company.
3	Bridge End	,,	J. Raybould.
	Bromley Hall	,,	Hunt, Brown, and Company.
	Bromley Lane	,,	R. Dolphin.
	,, New	,,	Pearson and Company.
	Chapel Hill	,,	Earl Dudley.
4	Clattershall	,,	J. Bowen.
5	Coal Leasows	,,	Parrish and Pearson.
	,,	,,	W. Watkins.
6	Corbyn Hall	,,	Matthews and Bond.
	Cricket Field	,,	Worcester and County Banking Company.
	Daisy Hill	,,	Matthews and Bond.
7	Delph	,,	Harpers and Moore.
8	Elm Tree	,,	Elm Tree Company.
	Lays	,,	W. M. Blair.
9	Lower Moor	,,	Mathews and Cooper.
10	Moor Lane	,,	Thomas Crew.
11	,,	,,	E. Baker and Company.
	Nagersfield	,,	Firmstone and Company.
	Shattersford	,,	Harris and Company.
12	Tiled House	,,	Matthews and Bond.
	Timberfield	,,	T. Skidmore.
	Areley	Bewdley, Worcester	Captain Pelley.
1	Blakemoor	,,	Mrs. Davies.
2	Gib-House	,,	W. Hanbury.
3	Mamble	,,	S. G. Blunt.
4	Old Hall	,,	Messrs. Hopcott.
	Hurdington	Bridgenorth	Mrs. Depper.

THE NORTH AND EAST DIVISION OF LANCASHIRE.

(*Manchester District.*)

H.M. Inspector, Joseph Dickinson, Pendleton, Manchester.

1	Agecroft	Pendlebury, Manchester	Andrew Knowles and Sons.
2	Albert	West Houghton, Bolton	John Gerrard.
3	Altham	Altham	William Edward Taylor.

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No.	Name of Colliery.	Where situated.	Owner's Name.
4	Anderton Hall	Blackrod	Dewhurst, Hoyle, and Smethurst.
5	Ashtons Field	Little Hulton	Bridgewater Trustees.
6	Ashworth	Rochdale	Richard and William Stott.
7	Aspin	Oswaldtwistle	Thos. Simpson and Company.
8	Bamford Closes	Wolstenholme	Samuel Lord and Brothers.
9	Back o' th' Height	Over-Darwen	John and Ralph Holden.
10	Bagslate Moor	Bagslate	William Beny.
11	Bank	Little Hulton	Executors of John Wright.
12	„ Hall	Burnley	George Hargreaves and Company.
13	„ Hey	Wardle, Rochdale	Edmund Fairburn.
14	„ House	Crompton, Oldham	Oldham, Middleton, and Rochdale Colliery Company (Limited)
15	„	Bagslate, Rochdale	Bankhouse Colliery Company.
16	„	Bagslate	„ „
17	„ Top	Radcliffe, Manchester	Knowles and Hall.
18	Bardsley	Bardsley, Ashton-under-Lyne	Bardsley Coal Company.
19	Barracks	Little Hulton	Bridgewater Trustees.
20	Belthorn	Oswaldtwistle	Thomas Simpson and Company.
21	Bents	Little Lever, Bolton	Thomas Fletcher.
22	Birtle Dean	Birtle, Bury	Thomas Ramsbottom and Sons.
23	Black Moss	Radcliffe, Manchester	Thomas Fletcher.
24	Blackrod	Blackrod	Thomas Whaley.
25	Blainscough Hall	Coppul, Chorley	James Darlington.
26	Boarshaw	Middleton, Manchester	Oldham, Middleton, and Rochdale Colliery Company (Limited).
27	Botany Bay	Clifton, Manchester	Clifton and Kearsley Company.
28	Bower	Hollinwood	Messrs. Marland.
29	Brandwood Moor	Cowpe, Waterfoot	James Brearley and Son.
30	„	„	Edward Ashworth and Company.
31	Bradford	Bradford, Manchester	Bradford Colliery Company.
32	Breightmet	Little Level, Bolton	James Hardcastle.
33	„	Breighmet	Thomas Fletcher.
34	Brex	Lower Whitwell	Hargreaves, Ashworth, and Company.
35	Bridge Mills	Whitworth, Rochdale	Ralph Rawstron.
36	Bridgewater	Worsley	Bridgewater Trustees.
37	Brimrod	Rochdale	Brimrod Colliery Company.
38	Brinsop Hall	Westhoughton	Brinsop Hall Colliery Company.
39	Britannia	Bacup	Townsend and Company.
40	Broad Oak and Moss	Ashton-under-Lyne	Fairbottom Colliery Company.
41	Broadfield	Westleigh	John Speakman.
42	„	Oswaldtwistle, Accrington	Thomas Simpson and Company.
43	Brotherod	Catley Lane, Rochdale	H. H. Fishwick and Company.
44	Broomstair	Denton, Manchester	Leigh and Bradbury.
45	Buckley Lane	Little Hulton	Bridgewater Trustees.
46	Bulls Head	Moorside, Oldham	Thomas Mellodew and Company.
47	Burgess Land	Little Hulton	Bridgewater Trustees.
48	Burnt Hills	Wholaw Nook, Burnley	George Hargreaves and Company.
49	Bus	Clifton, Manchester	Clifton and Kearsley Company.
50	Butterworth Hall	Milnrow, Rochdale	Richd. and Wm. Stott.
51	Cartridge Nook	Wardle, Rochdale	James Dearden.
52	Cat Hole	Broad Oak, Accrington	Hargreaves, Ashworth, and Company.
53	Chadwick Hall	Rochdale	Roscow and Lord.
54	Chamber	Hollinwood	Chamber Colliery Company.
55	Change, Greave Clough and Lawick.	Bacup	George Maxwell.
56	Chanters	Atherton	John Fletcher and Company.
57	Cheesden Bar	Bury	John Haworth.
58	Chelburn	Littleborough	Rochdale Brick and Tile Company (Limited).
59	Clamerclough Pottery	Farnworth	John Gerrard and Son.
60	Clayton	Clayton, Manchester	Leigh and Bradbury.
61	Cleggswood Pottery	Littleborough	Hall and Rogers.
62	Clifton Hall	Clifton, Manchester	Andrew Knowles and Sons.
63	Clifton Moss	„	„ „
64	Clough Head Brickworks	Todmorden	Thos Temperley.
65	Cob House and Lark Mount	Birtle, Bury	E. D. Milnes and Brother.
66	Cockey Moor	Ratcliffe, Manchester	Rylands and Sons.
67	Combermere	Tyldesley	Tyldesley Colliery Company.
68	Coppull Hall	Coppull	Norley Hall Colliery Company.
69	Coppy	Cliviger, Burnley	Cliviger Coal Company.
70	Coney	Over-Darwen	Coney Colliery Company.
71	„	„	Taylor and Holden.
72	Cornfield	Gawthorp	George Hargreaves and Company.
73	Cragg	Bacup	Butterworth and Brooks.
74	Cranberry Moss	Entwistle, Bolton	James Barlow.
75	Crook Bank	Wardle, Rochdale	Charles Crossley.
76	Cross Hillock	Astley	Askey and Tyldesley Coal and Salt Company (Limited).
77	Crow Knowl	Crompton, Oldham	Edmund Butterworth and Sons.
78	„ Nest	Milnrow	Roscow and Lord.
79	Cupola	Hameldon	Brooks and Pickup.
80	Darcy Lever	Darcy Lever	Darcy Lever Coal Company.
81	Dean	Water Rossendale	Hargreaves, Ashworth, and Company.
82	Deansgreave	Bacup	John Lord.
83	Dearnley	Rochdale	Schofield and Company.
84	Delph	Middle Hulton	Bridgewater Trustees.
85	Denton	Denton, Manchester	Peter Rothwell.
86	Denton Lane and Ferney Field	Chadderton	Chamber Colliery Company.
87	Dock	Ashton-under-Lyne	Fairbottom Colliery Company.
88	Doffcocker and Vallets	Halliwell, Bolton	Thomas Cross.
89	Dogshaw	Over-Darwen	Eccles Shorrock Brothers and Company.
90	Dootson Vauze	Blackrod	Samuel Leather.
91	Duckworth Hall	Oswaldtwistle	Thos. Simpson and Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
92	Dunkenhalg Park	Church Accrington	Exors. of Joseph Barnes.
93	Duxbury and Chorley	Chorley	Thos. Whittle.
94	Edge Fold	Worsley	Bridgewater Trustees.
95	Ellenbrook	Tyldesley	" "
96	Elpit Edge	Butterworth	James Leach.
97	Elton	Elton, Bury	William Thornton Parks.
98	Farnworth Bridge	Little Lever, Bolton	Andrew Knowles and Sons.
99	Fearneyside	"	" "
100	Flash	Eccleshill	Eccleshill Coal and Coke Company.
101	Foggs	Davey Lever, Bolton	Andrew Knowles and Sons.
102	Foxclough	Colne	George Hargreaves and Company.
103	Foxhill	Middle Whitwell	Hargreaves, Ashworth, and Company.
104	Foulclough	Walsden, Todmorden	Reuben Haigh and Company.
105	Freeholds	Facit, Bacup	Benjamin and Joseph Lees.
106	Freeholds, Rook View	Whitworth	Abraham Hill.
107	Gannow	Habergham	George Hargreaves and Company.
108	Gatley	Tyldesley	Bridgewater Trustees.
109	Gibfield	Atherton	John Fletcher and Company.
110	Glodwick	Oldham	James Collinge and Company.
111	Great Boys	Tyldesley	Thomas Fletcher.
112	" Harwood	Accrington	Executors of Richard Fort.
113	" Lever	Great Lever	The Earl of Bradford.
114	" Works	"	" "
115	Greave	Bacup	Townsend and Company.
116	" New	"	Executors of James I. Law.
117	Greenacres	Oldham	Lees and Company.
118	Green Booth and Knowl	Wolstenholme	James Butterworth and Son.
119	Grime Bridge	Middle Whitwell	Hargreaves, Ashworth, and Company.
120	Hacken	Darcey Lever	Earl of Bradford.
121	Handle Hell	Calderbrook	James Dearden.
122	Hanging Chadder	Rochdale	Oldham, Middleton, and Rochdale Colliery Company (Limited)
123	Hapton	Burnley	John Sutcliffe Witham.
124	" Valley	Hapton, Burnley	George Hargreaves and Company.
125	Hartford	Oldham	Oldham, Middleton, and Rochdale Colliery Company (Limited).
126	Hartshead	Ashton-under-Lyne	Fairbottom Colliery Company.
127	Harwood and Bradshaw	Firwood, Bolton	James Hardcastle.
128	Haugh Hey	New Hey, Rochdale	Haugh Hey Colliery Company.
129	Haughton	Haughton, Manchester	Thomas Shaw and Sons.
130	" Green	"	" "
131	Healey Hall Bottoms	Rochdale	Jacob Tweedale and Sons.
132	Heath Charnock	Heath Charnock	Heaton and Company.
133	Heskin Hall	Heskin, Chorley	Heskin Hall Company.
134	Hey Clough	Wardle	Samuel Stott.
135	" Fold	Over-Darwen	Eli Walsh.
136	Heyfield	Leigh, Manchester	James Diggle.
137	Heys	Ashton-under-Lyne	Fairbottom Colliery Company.
138	High Field	Moorside, Oldham	Sunderland Brothers.
139	Higginshaw	Royton, Oldham	Joseph Bagnall.
140	High Houses	Bacup	Townsend and Company.
141	Higher Shore	Littleborough	James Fletcher and Brothers.
142	Hoddlesden	Over-Darwen	Joseph Place.
143	Hodge Clough	Oldham	George Mellodew.
144	Hogshead	Bacup	Mrs. Ann Maden.
145	Holebottom	Oldham	Leeses, Jones, and Company.
146	Hole in Band	Accrington	Hargreaves, Ashworth, and Company.
147	Hollingworth	Hollingworth	John Taylor and Company.
148	Honeywell Lane	Oldham	Booth and Marland.
149	Hopwood	Middleton, Manchester	Oldham, Middleton, and Rochdale Colliery Company (Limited).
150	Horrocks Court	Edgeworth	Executors of Thomas Fogg.
151	Howarth's Field	Farnworth	Bridgewater Trustees.
152	Howbridge	Atherton	John Fletcher and Company.
153	Hudclough	Facit, Rochdale	Smithson and Butterworth.
154	Hulton	Over Hulton	William Ford Hulton.
155	" Park	"	"
156	Intake	Cowpe, Waterfoot	John Woodhead.
157	Jubilee	Crompton, Oldham	Oldham, Middleton, and Rochdale Colliery Company (Limited).
158	Kearsley	Kearsley, Bolton	Samuel Scowcroft.
159	Ladyshore	Little Lever, Bolton	John Fletcher.
160	Land	Shawforth, Rochdale	James Dearden.
161	Lee	Bacup	Thomas Leach.
162	"	"	Oldham, Middleton, and Rochdale Company (Limited).
163	Light Owlers and Pikehouse	Littleborough	Lees and Tetlow.
164	Limehurst	Ashton-under-Lyne	Limehurst Colliery Company.
165	Limeside	Limeside	Thomas Ramsbottom and Sons.
166	Linnyshaw	Worsley	Bridgewater Trustees.
167	Little End	Oldham	Kay and Wilks.
168	" Hey	Stoneclough	Knowles and Stott.
169	" Mine	Higher Barrowshaw	Lees and Mayall.
170	Livesay Fireclay Works	Livesay	Orlando Brothers.
171	Longley Hey	Littleborough	Kershaw Brothers.
172	Lords Fields	Ashton-under-Lyne	Lords Fields Colliery Company.
173	" Moss Field	Farnworth	Bridgewater Trustees.
174	Low Crompton	Rochdale	Oldham, Middleton, and Rochdale Company (Limited).
175	Lower Darwen	Blackburn	Thomas Simpson.
176	" Moor	Oldham	Mayall and Seddon.
177	Low Side	"	John G. Blackburne.

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No.	Name of Colliery.	Where situated.	Owner's Name.
178	Madam's Wood	Little Hulton	Bridgewater Trustees.
179	Mangnall's	Worsley	"
180	Manor	Clifton, Manchester	Clifton and Kearsley Company.
181	Marklands	Blackrod	Thomas Whittle.
182	Marsden	Marsden, Burnley	George Hargreaves and Company.
183	Martholm	Great Harwood	Executors of Richard Fort.
184	Meadow Head	Wolstenholme	Meadow Head Colliery Company.
185	Meadows	Bacup	Hargreaves, Ashworth, and Company.
186	Mesne Lea	Worsley	Peter Nightingale and Company.
187	Messhing Trees	Tyldesley	William Ramsden.
188	Monk's Bank	Quarlton, Bury	Charles Whowell.
189	Mosley Common	Tyldesley	Bridgewater Trustees.
190	Mossfield	Oswaldtwistle	Thomas Simpson and Company.
191	Moston	Moston, Manchester	Executors of John Stanley.
192	Nelson and Rocher	Ashton-under-Lyne	Fairbottom Colliery Company.
193	New Barn Brick Works	Bacup	James Taylor.
194	" Fields	Horwich	William Knight.
195	" Lester	Tyldesley	James and William Roscoe.
196	" Line	Bacup	Benjamin and Joseph Lees.
197	" Watergate and Peel Hall	Little Hulton	James and William Roscoe.
198	Nook	Tyldesley	Astley and Tyldesley Coal and Salt Company (Limited).
199	Oak	Hollinwood	Chamber Colliery Company.
200	Oaken Clough	Bacup	Executors of James Butterworth.
201	Old Clap Gate	Bagslate, Rochdale	Ralph Rawstron.
202	" Clough	Bacup	Hargreaves, Ashworth, and Company.
203	" Lyons	Over-Darwen	Fish and Holden.
204	" Sink and Greenland	Rowley Moor, Rochdale	John Lomax and Company.
205	Openshaws	Birtle, Bury	Edmund Turner.
206	Outwood	Outwood, Manchester	Thomas Fletcher and Sons.
207	Over-Darwen Brickworks	Over-Darwen	Ralph Entwistle.
208	Owens	Leigh, Manchester	James Diggle.
209	Padiham	Padiham	George Hargreaves and Company.
210	Park	Oldham	Bailey and Dronsfield.
211	" Hall	Blackrod	Arley Main Colliery Company.
212	Pemberton House	Charnock, Richard, Chorley	James Barker.
213	Pendlebury	Pendlebury, Manchester	Andrew Knowles and Sons.
214	Pendleton	Pendleton, Manchester	"
215	Pole	Over-Darwen	William Pickup.
216	Radcliffe	Radcliffe, Manchester	Knowles and Hall.
217	" Moor	Ainsworth	Thomas Fletcher.
218	Raikes	Great Lever	Earl of Bradford.
219	Rake Pottery	Littleborough	Rawstrons and Stott.
220	Red Lumb	Wolstenholme	Moscrop Brothers.
221	Redshaw	Walmersley	Executors of Lawrence Duckworth.
222	Rhodes Bank	Oldham	Leeses, Jones, and Company.
223	Ridingo	Wardle	Ridingo Colliery Company.
224	Ripby Hill	Blackrod	Dewhurst, Hoyle, and Smethurst.
225	Ringley Fold	Kearsley, Manchester	Knowles and Stott.
226	Rivin, New	Little Lever, Bolton	Andrew Knowles and Sons.
227	Robin Hill	Oldham	Oldham, Middleton, and Rochdale Colliery Company (Limited).
228	Robin Hood	Clifton, Manchester	Clifton and Kearsley Company.
229	Rose Hill	Burnden, Bolton	Samuel Scowcroft.
230	Rowley	Burnley	George Hargreaves and Company.
231	Salmon Field	Royton, Oldham	John Smethurst.
232	Sanderson	Worsley	Bridgewater Trustees.
233	Sapling Field	Middle Hulton	"
234	Scar End	" Whitwell	Hargreaves, Ashworth, and Company.
235	Scot Lane	Blackrod	William Woods and Son.
236	Scout Moor	Shuttleworth	Executors of Lawrence Duckworth.
237	Shakerley	Shakerley	William Ramsden.
238	"	"	Tyldesley Colliery Company.
239	Sharples	Sharples, Bolton	Andrew Knowles and Sons.
240	Sheepbank	Littleborough	Sheepbank Colliery Company.
241	Shipperbottom	Walmersley	Executors of Lawrence Duckworth.
242	Sholver	Crompton, Oldham	Oldham, Middleton, and Rochdale Company (Limited).
243	Shorey Bank	Over-Darwen	Shorey Bank Colliery Company.
244	Singing Clough	Kearsley	Knowles and Stott.
245	Sladen	Littleborough	Tellow, Lees, and Kershaw.
246	Smallbridge	Rochdale	Lomax and Company.
247	Smear Hall	Wray with Botton	John Newby.
248	Smithfold	Little Hulton	John Gibson and Company.
249	Snapes	Leigh, Manchester	John Gregory.
250	South Grain	Dulcsgate	James Dearden.
251	Spindlepoint	Clifton, Manchester	Clifton and Kearsley Company.
252	Springfield	Coppull, Chorley	James Darlington.
253	Stacksteads	Stacksteads	Hargreaves, Ashworth, and Company.
254	Stand Lane	Radcliffe Bridge	Stand Lane Colliery Company.
255	Stanhill	Oswaldtwistle	Thos. Simpson and Company.
256	Starring	Littleborough	Ralph Ashworth and Company.
257	Stockfield	Chadderton	Chamber Colliery Company.
258	Stonehill	Farnworth, Bolton	Roscow and Lord.
259	Stopes	Little Lever	Thomas Fletcher.
260	Street Gate	Little Hulton, Bolton	Matthew Bennett and Brothers.
261	Swinshaw	Crawshaw Booth	Hargreaves, Ashworth, and Company.
262	Syke	Hollingworth	Lees and Ashworth.
263	Toadleach	Healey, Rochdale	James Dearden.
264	Todmorden Moor	Todmorden	"
265	Tonge	Tonge, Bolton	Jethro Scowcroft.
266	Tonges Field	Farnworth	Bridgewater Trustees.

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No.	Name of Colliery.	Where situated.	Owner's Name.
267	Tonnacliffe	Rochdale	Samuel Tweedale.
268	Tooter Hill	Bacup	James Dearden.
269	Top-o'-th'-Meadow	Darcy Lever	John Seddon.
270	Towneley	Burnley	Brooks and Pickup.
271	Tunshill	Milnrow, Rochdale	Richd. and William Stott.
272	Turton Moor Brick Works	Turton, Bolton	Turton Moor Colliery Company.
273	Tyldesley	Tyldesley	Tyldesley Colliery Company.
274	„	„	Astley and Tyldesley Coal and Salt Company (Limited).
275	Union	Cliviger, Burnley	Cliviger Coal Company.
276	Unity Brook	Kearsley, Bolton	James Stott and Company.
277	Victoria	Rumworth	John Rosbottom and Sons.
278	„	Baxenden	Hargreaves, Ashworth, and Company.
279	Wallnook	Wardle, Rochdale	James Dearden.
280	Wardley Coppice Field	Worsley	Bridgewater Trustees.
281	Waterside	Waterside, Darwen	Adam Bullough.
282	Welch Whittle	Welch Whittle, Chorley	James Darlington.
283	Wellclough	Greensmoor, Stacksteads	Executors of James Hardman.
284	Westleigh	Leigh, Manchester	James Diggle.
285	„ (Nos. 1 and 2)	„	Wigan Coal and Iron Company (Limited).
286	Wetearth	Clifton, Manchester	Clifton and Kearsley Company.
287	Wharton	Little Hulton, Bolton	Francis Charlton.
288	Whitaker	Littleborough	The Whitaker Company.
289	Whitefield	Radcliffe	Stand Lane Colliery Company.
290	Whitewell	Healey	John Buckley.
291	Whittlefield	Burnley	George Hargreaves and Company.
292	Wholaw Nook	Wholaw, Burnley	Brooks and Pickup.
293	Wilderswood	Rivington	Nicholas Fish.
294	Wildersmoor	Horwich, Bolton	Andrew Peake.
295	Winter Hill	„	Adam Mason.
296	Withnell Fireclay Works	Withnell, Chorley	John Parkinson Parke.
297	Woodnook	Accrington	Hargreaves, Ashworth, and Company.
298	Woodhouse Lane	Bagslate, Rochdale	Zech. and James Howarth.
299	Woodpark	Bardsley	Fairbottom Colliery Company

THE WEST DIVISION OF LANCASHIRE.

H.M. Inspector, PETER HIGSON, Manchester.

ST. HELENS.

1	Blackleyhurst	Ashton-in-Makerfield	Sam. Stock.
2	Crank	Rainford	The Crank Colliery Company.
3	Edge Green	Golborne	Richard Evans and Company.
4	Garswood Park	St. Helen's	David Bromilow and Company.
5	Halsnead	Whiston	Lee, Williams, and Pugh.
6	Haydock	Ashton-in-Makerfield	Rich. Evans and Company.
7	High Brook	„ „	Mercer and Evans.
8	Laffak and Garswood	Parr	Laffak and Garswood Colliery Company.
9	Nut Grove	Sutton	James Radley.
10	Parr	Ashton-in-Makerfield	Richard Evans and Company.
11	Peaseley House	Parr	Bournes and Robinson.
12	Pewfall	„	Richard Evans and Company.
13	Birchfield	Prescot	John Middlehurst.
14	Ravenhead	Sutton	Bromilow, Haddock, and Company.
15	Riding Lane	Ashton-in-Makerfield	Cross, Tetlow, and Company.
16	The Mesnes	„ „	„ „
17	Senela Green	„ „	Samuel Stock.
18	St. Helen's	St. Helen's	Pikington Brothers.
19	Sankey Brook	Parr	Sankey Brook Coal Company (Limited).
20	Sutton	Sutton	„ „ „

WIGAN.

1	Ackhurst	Pemberton	Roper and Livesey.
2	Albion and Stonehouse	Hindley	John and Thomas Wood.
3	Almond Brook	Standish	Wigan Coal and Iron Company.
4	Amberswood	Ince-in-Makerfield	Jonathan Blundell and Son.
5	Aspull	Wigan	Wigan Coal and Iron Company.
6	Barley Brook	„	Pearson and Knowles.
7	Bickershaw	Alram and Leigh	Ackers, Whitley, and Company.
8	Birkett Bank	Wigan	Crompton and Shawcross.
9	Bickerstaffe	Bickerstaffe	Bromilow, Forster, and Company.
10	Bradley Hall	Standish	Benjamin and Richard Fisher.
11	Bradshaw Hall	Aspull	Wigan Coal and Iron Company.
12	Broad Oak	Hindley Green	John Speakman and Son.
13	Bromley Field	Gidlow Lane, Wigan	Wigan Coal and Iron Company.
14	Broomfield and Standish	Standish	„ „
15	Brynn	Ashton-in-Makerfield	Entwistle and Whittles.
16	„ Hall	„ „	W. and J. B. Cripping.
17	Bury Street	Skelmersdale	John Houghton.
18	California	Hindley	Wigan Coal and Iron Company.
19	Chapel House	Skelmersdale	Thomas Farimond.
20	„	„	Chapel House Coal Company.
21	Close Lane	Hindley	Thomas Stone.
22	Crow Orchard	Skelmersdale	Crow Orchard Coal Company.
23	Downhall Green	Ashton	Thomas Stone.
24	Douglas Bank	Wigan	John Grant Morris.
25	Fir Tree House	„	Crompton and Shawcross.
26	Garswood Hall	Ashton	Garswood Hall Colliery Company.
27	Gidlow and Swinley	Wigan	John Rylands and Sons.
28	„ Lane	„	Thomas Jolley.

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No.	Name of Colliery.	Where situated.	Owner's Name.
29	Greenslate	Shevington	Wm. Marsh and John Redshaw.
30	Haigh	Haigh	Wigan Coal and Iron Company.
31	Hindley	Hindley and Ince	" "
32	" Fields	" Wigan	Norris and Lees.
33	" Hall	Near Wigan	Pearson and Knowles.
34	" Green	Hindley	John Scowcroft and Company (Limited).
35	Holland	Upholland	Wigan Coal and Iron Company.
36	Holme House	Wigan	Ralph Rimmer.
37	Hosier House	Ince-in-Makerfield	Thomas Gidlow.
38	Ince Hall	Ince	Crompton and Shawcross.
39	" Hall Coal and Cannel Works	Wigan	Ince Hall Coal and Cannel Company.
40	" Moss	"	Pearson and Knowles.
41	Kirkless	Aspull	Wm. Barton.
42	" Hall	Kirkless	Wigan Coal and Iron Company.
43	Ladies' Lane	Hindley and Ince	Thomas Gidlow.
44	Low Hall	Wigan	Moss Hall Coal Company.
45	Meadow House	"	Lamb and Moore.
46	Mesnes	"	Charles Turner.
47	Mile Stone	Ince, Wigan	Clemenshaw and Company.
48	Moss Hall	Wigan	Moss Hall Coal Company.
48	" House	Rainford	Horn Kelly and Company.
49	New Springs	Haigh	Norriss and Lees.
50	" Town	Pemberton	Lamb and Moore.
51	Norley Hall	"	Norley Hall Coal and Cannel Company.
52	Orrell	Wigan	Wil. Hill, Brancker, and Company.
53	Park Lane	"	Mercer and Evans.
54	Pemberton	Orrell, Wigan	Jonathan Blundell and Son.
55	Platt Lane	Wigan	Wigan and Whiston Coal Company (Limited).
56	Rainford	"	Moss Hall Coal Company.
57	Moss House	Rainford	Moss House Company.
58	Rose Bridge	Ince, Wigan	John Grant Morris.
59	" Hill	"	John Laithwaite.
60	Shevington	Pemberton	John Tayleur and Company.
61	" Cannel Works	"	Wigan Coal and Iron Company.
62	Springs	Ince-in-Makerfield	Pearson and Knowles.
63	Standish Lower Ground	Standish	Wigan Coal and Iron Company.
64	Strangeways Hall	Hindley Green	Strangeways Hall Coal Company.
65	Swan Lane	" "	Edward Johnson.
66	Tawd Vale	Skelmersdale	Tawd Vale Coal Company (Limited).
67	The Mesnes	Ashton-in-Makerfield	Parr and Cross.
68	Victoria	Standish	Wigan Coal and Iron Company.
69	"	Rainford	Walmsley and Company.
70	Winstanley	Winstanley	Meyrick Bankes.
71	Whiston	Prescot	Wigan and Whiston Coal Company (Limited).
72	White Moss	Skelmersdale	The White Moss Coal Company.
73	"	"	Lord Skelmersdale.

CHESHIRE.

H.M. Inspector, THOMAS WYNNE, Stone.

1	Adlington	Adlington, near Stockport	Jonathan Jowett.
2	Astley	Duckinfield	Dunkirk Coal Company.
3	Back Spands	Lyme Prestbury	Wm. Hewitt.
4	Bakestone Dale	Pott Shrigley, Macclesfield	William Gardiner.
5	Banks End	Disley	L. and E. Hall.
6	Bayley Field	Hyde	T. Jas. and John Ashton.
7	Beard and Bugsworth	Hayfield	Levi and E. Hall.
8	Burned Edge	"	"
9	Bredbury	Stockport	The Bredbury Coal Company.
10	Dukinfield	Dukinfield, Stockport	Dukinfield Coal Company.
11	"	" "	Dunkirk Coal Company.
12	Dunkirk	" "	" "
13	Eddisbury	Rainow	Jonathan Hulley.
14	Fire Clay Colliery	Dukinfield	John Hall and Son.
15	Horse Leason	Dawley	Wm. Dainty.
16	Hough Hole Day Eye	Rainow, Macclesfield	Wm. Mellor.
17	Hyde	Hyde	Leigh and Bradbury.
18	Little Neston	Neston-on-Dee	B. Chandler.
19	Lymer Clough	Rainow, Macclesfield	
20	Middle Cale	High Lane, Stockport	Isaac Brocklehurst and Company.
21	Norbury	Norbury, near Stockport	Clayton and Brooke.
22	Potts Brick Works	Pott Shrigley, Macclesfield	George Lambert.
23	Poynton and Worth	Poynton, near Stockport	Lord Vernon.
24	Robinsclough	Wildboarclough	William and Harold Hand.
25	Roe Wood	Macclesfield	George Needham.
26	Sponds	Lyme Handley	James Jackson.
27	Throstles Nest	Macclesfield	George Needham.
28	Whaley	Texal	

SHROPSHIRE.

H.M. Inspector, THOMAS WYNNE, Stone.

1	Ascott New Colliery	Longdon	J. Proctor.
2	Asterley	Shrewsbury	H. Gardener and Company.
3	" New	"	Cooke, Cox, and Company.
4	Benthall	Broseley	Benthall Pottery Company.
5	"	"	James Evans and W. Gough.
6	Billingsley	Bridgnorth	Wm. Birchley.
7	Black Lion	Shrewsbury	George Fenn.
8	British	Oswestry	Wm. O. Savin.

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No.	Name of Colliery.	Where situated.	Owner's Name.
9	Broseley	Broseley	William Exley.
10	,,	Wellington	Hill and Aston.
11	,,	,,	
12	,,	,,	W. O. Foster.
13	,,	,,	
14	,,	,,	Coalbrookdale Company.
15	Calcuts	Ironbridge	W. O. Foster.
16	Castle Place	Shrewsbury	— Wilde.
17	Clee Hills	Ludlow	Beriah Botfield.
18	Coed-y-goe	Oswestry	Wm. O. Savin.
19	Coniebury	Broseley	Thomas Plimley.
20	Dark Lane	Wellington	Leighton and Grenfel..
21	Dawley Green	Dawley	Henry Cooke.
22	,, Bank	,,	Coalbrookdale Company.
23	Donnington Wood	,,	Lilleshall Company.
24	Drill	Oswestry	John and Richard F. Croxon.
25	Frodesley	Shrewsbury	Ed. Sheppard.
26	Granville	Newport	Lilleshall Company.
27	Hadley	Wellington	,, ,,
28	Harcourt	Arley	Robert Jones.
29	Haycop	Broseley	H. Hill and Jas. Aston.
30	,, Hill	,,	,, ,,
31	Horsehays	Wellington	Coalbrookdale Company.
32	Hinks Hay	Dawley	Leighton and Grenfell.
33	Ifton	Oswestry	J. J. Holdsworth and John B. Booth.
34	Ketley	Wellington	Poole and Company.
35	,,	,,	Ketley Company.
36	,,	,,	,, ,,
37	Knowbury	Ludlow	T. and W. Pearson.
38	Langley Fields	Dawley	Leighton and Grenfell.
39	Lawley	,,	Coalbrookdale Company.
40	,, Bank	,,	,, ,,
41	Lightmoor	,,	,, ,,
42	Lodge	Wellington	Lilleshall Company.
43	Lebotwood	Shrewsbury	R. Preen.
44	Madeley Court	Ironbridge	W. O. Foster.
45	,, Wood	,,	Anstice and Company.
46	Malinslee and Stirchley or Old Park.	Dawley	Old Park Company.
47	Moreton Hall	,,	Woodcock, Sons, and Eckersley.
48	Moat Hall	Shrewsbury	T. Jones.
49	Penylan	Oswestry	Messrs. Croxon.
50	Presgwynne	,,	Moreton Hall and Presgwyn Colliery Company.
51	Priorslee	Wellington	Lilleshall Company.
52	Quinta	Oswestry	Quinta Colliery Company.
53	Rock	Broseley	W. O. Foster.
54	Saint Georges	Shiffnall	Lilleshall Company.
55	Shorthill	Shrewsbury	John Atherton.
56	Trefonen	Oswestry	T. Walmsley and Company.
57	Woodhouse	Shiffnall	Lilleshall Company.
58	Wombridge	Wellington	A. Peplow.
59	,,	,,	John Bennett and Co.

GLOUCESTERSHIRE.

Forest of Dean.

H.M. Inspector, Lionel Brough, Clifton, Bristol.

1	Addis Hill Level	Cinderford	Henry Crawshay and Company.
2	Bilson	,,	Aaron Gould and Company.
3	Blakeney Level	Blakeney	Blakeney and Forest of Dean Coal Company (Limited).
4	Cross Knave, Five Acres	Coleford	Benjamin Davis.
5	Crumpmeadow	Cinderford	Aaron Gould and Company.
6	Darkhill	Coleford	Titanic Steel Company.
7	Duck Pit	Cinderford	Goold and Company.
8	Edenwall	Coleford	Wanklyn and Grindell.
9	Farmers Folly	,,	P. W. Holmes.
10	Findall	,,	J. H. Warman.
11	Foxes Bridge	Newnham	Barrett and Crawshay.
12	Haywood	Cinderford	Henry Crawshay and Company.
13	Hopewell Engine	Coleford	Western Counties Colliery Company (Limited).
14	,, Level	,,	Trotter, Thomas, and Company.
15	,, in Wimbelow	,,	Hopewell Company.
16	Howbeach Level	Blakeney	Blakeney and Forest of Dean Company (Limited).
17	Howlerslade	Coleford	Trotter, Thomas, and Company.
18	Kidnall's High Delf Dipple	Lydney	J. Morell's Executors.
19	Lightmoor	Cinderford	Henry Crawshay and Company.
20	Miles Level	Coleford	Western Counties Colliery Company (Limited).
21	Morse Level	,,	Blakeney and Forest of Dean Company (Limited).
22	Nailbridge	Mitcheldean	James A. Brown.
23	Nelson	Coleford	Osmund Barrett.
24	New Bowson	Cinderford	New Bowson Deep Coal Company.
25	,, Fancy	Newnham	Park End Coal Company.
26	Norchard	Lydney	J. Morrell's Executors.
27	Oaken Level and White Lea	,,	Thomas Allaway.
28	Old Fire Engine	Coleford	Edward Teague and Joseph Bennet, jun.
29	,, Furnace Coal Level	,,	Trotter, Thomas, and Company.
30	Park End	Lydney	Park End Coal Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
31	Phipp's Pillowell	Lydney	Phipps and Price.
32	Pillowell	"	Pillowell Colliery Company.
33	Potlid	Coleford	P. Teague and Company.
34	Princess Royal	"	Samuel Morgan.
35	Resolution and Safeguard	Newnham	Henry Crawshaw and Company.
36	Royal Forester	Coleford	Speech House Hill Colliery Company (Limited).
37	Soundwell Works	"	Soundwell Company.
38	Speedwell	"	H. A. Nourse.
39	Speculation	"	Henry Harris.
40	Standfast	Newnham	Park End Coal Company.
41	Stapledge	"	J. H. Warman.
42	Thatchpit	Holy Trinity (Nailbridge)	Mrs. Loxley.
43	The Futterill	Coleford	Western Counties Colliery Company (Limited).
44	Trafalgar and Rose in Hand	"	T. B. and W. B. Brain.
45	Tuft's Level	Lydney	James Morrell's Executors.
46	Uncertainty	Coleford	James Morse.
47	Villett's Level	"	Trotter, Thomas, and Company.
48	Wallsend	"	Wallsend Company.
49	Worrall Hill	"	Henry Harris.
50	Woodside	Ruardean	High Delf Colliery Company.
	Bristol Coal Field.		
1	Barr's Court	Bristol	Holwey, Steedes, and Company (ceased).
2	Brandy Bottom	Pucklechurch, four miles S. of Chipping Sodbury.	Jefferies, Walters, and Company.
3	Bull Hall	Four miles E. of Bristol	Leonard Jefferies and Company.
4	Hole Lane		
5	Coal Pit Heath	Frampton Cotterell	Sir Greville Smith, Bart.
6	Easton	Bristol	Leonard, Boult, and Company.
7	Golden Valley	Bath	Aaron Brain and Company.
8	Kingswood	Bristol	Kingswood Coal and Iron Company (Limited).
9	Parkfield	Mangotsfield	Wethered, Cossham, and Wethered.
10	Penywell Lane	Bristol	Brown and Harris.
11	Rangeworth	"	Crosley and Company.
12	Shortwood	"	Isaac White.
13	Whitehall	"	Leonard, Boult, and Company.
14	Yate Works	Yate, one mile from Chipping Sodbury.	Long, Nowell, and Company.
	SOMERSETSHIRE.		
	Nettlebridge District.		
1	Nettlebridge	Nettlebridge	W. Evans and Company.
2	Newbury	"	Westbury Iron and Colliery Company.
3	New Rock	"	Plummer and Sons.
4	Vobster (Old and New)	"	Stephen Steeds and Company.
5	Edford	"	Fussell, Walters, Brise, and Company.
6	Mells	Frome	Naish and Steeds.
	Radstock District.		
1	Braysdown	Radstock	Wait, Savage, and Company.
2	Clandown	"	Charles Hollwey.
3	Foxcote	"	Wait, Savage, and Company.
4	Huish	"	" "
5	Old Welton	"	Mogg and Company.
6	Radstock Works	"	Countess Waldegrave.
7	Welton Hill	"	C. Hollwey and Company.
8	Writhlington, Lower	"	T. Smith and Company.
9	" Upper	"	" "
10	Wellsway	"	Countess Waldegrave.
	Paulton District.		
1	Bishop Sutton	Paulton	Hollwey and Company.
2	Conygre, Lower (Timsbury)	"	Samborne, Smith, and Company.
3	" Upper	"	" "
4	Camerton New Pit	"	Miss Jarrett.
5	" Old Pit	"	"
6	Farrington	"	Hollwey and Company.
7	Fry's Bottom	"	Dudelin, Rossiter, Hill, and Company.
8	Grayfield	"	Hollwey and Company.
9	Old Grove (Timsbury)	"	Mogg, Parish, and Company.
10	" Mills	"	Wm. Evans and Company.
11	Paulton Engine	"	Evans, Hill, and Company.
12	Withy Mill (Timsbury)	"	Mogg, Parish, and Company.
	Twerton District.		
1	Twerton	Bath	F. and D. Brown.
	Bedminster Coal Field.		
1	Ashton Vale	Bristol	Ashton Vale Company (Limited).
2	Bedminster Dean Lane	"	Bedminster Coal Company.
3	Starveale	"	Henry Bennett.
4	Malago	"	Steeds.
	Nailsea Coal Field.		
1	Nailsea Heath	Bristol	Wm. Morgan.

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No.	Name of Colliery.	Where situated.	Owner's Name.
	DEVONSHIRE.		
1	Bovey Tracey	Newton Bushell	John Divett.
	MONMOUTHSHIRE.		
	H.M. Inspector, LIONEL BROUGH, Clifton, Bristol.		
1	Aberbeeg	Newport	Webb and Spittle.
2	Abercarn Works	"	Ebbw Vale Company (Limited).
3	Abersychan Works	Ebbw Vale	" Iron Company (Limited).
4	Aberystruth	Blaina	J. and C. Bailey.
5	Arall	Newport	Latch and Cope.
6	Argoed	Tredegar	Tredegar Iron Compnay.
7	" Upper, Holly Bush	Newport	Edmund D. Williams.
8	Barcella	Newbridge	Cope and Latch.
9	Beaufort Works	Nantyglo	J. and C. Bailey.
10	Bedwas Colliery	Near Newport	T. P. Price.
11	Blaenavon Works	Pontypool	Blaenavon Iron Company.
12	Blaen Cuffin	Newport	Thomas Jones.
13	Blaendare	Pontypool	John Wightman and Company (Limited).
14	Blaina	Newport	Blaina Company.
15	Blancuffin	"	Trustees of late Thos. Brothers Prothero.
16	Bryngwyn	"	W. S. Cartwright.
17	Brynore Colliery	"	Webb and Spittle.
18	Cefn Llwyna	"	Lewis and Jenkins.
19	Cefn-y-Crib Mountain	Pontypool	Rachel Phillips.
20	Church	Newport	Trustees of late Thomas Prothero.
21	Coalbrook Vale Works	Blaina	Major M'Donald.
22	Coedcae Tillery	Newport	J. Price and Company.
23	Cwmyglo	Near Newport	Bedwas and Lantwit Company (Limited).
24	Cwmbran	Pontypool	John Lawrence.
25	Cwm Colliery	Newport	John Crook and Company.
26	" Darran	"	Nicholas and Johnson.
27	" Frwd	Pontypool	Partridge and Jones.
28	" Lucu	"	Ebbw Vale Company (Limited).
29	" Tylery	Newport	South Wales Colliery Company (Limited).
30	Cwmnaut ddu	"	Ebbw Vale Company (Limited).
31	Cwmcelyn	Blaina	Major M'Donald.
32	Durban	Llanhileth, near Newport	Thomas Philips Price.
33	Ebbw Vale Works	Ebbw Vale	Ebbw Vale Company (Limited).
34	Gilbach Bargoed	Newport	Cope and Latch.
35	Glyngaer	Llanhileth, near Newport	E. D. Williams.
36	Golynos Works	Pontypool	William Richards.
37	Golynos	"	Partridge and Jones.
38	Gwrhay and Penyvan	Newport	Roger Lewis.
39	Hafod	Abergavenny	Brecon Boat Company.
40	Hafod Van	Newport	Thomas Phillips Price.
41	Havodtrisglod	"	" "
42	Henllis	"	Hanson and Company.
43	Holybush	"	E. D. Williams.
44	Hope	"	Henry and Walter Powell.
45	Mamhole	Newport	Thomas Phillips Price.
46	Milfrain Hill New Colliery	Blaenavon	John Jayne.
47	Nantyglo Works	Nantyglo	J. and C. Bailey.
48	New Bedwellty	Newport	Tredegar Iron Company.
49	" Cwm Dows	"	Martin Morrison.
50	" Place	"	Trustees of late Thos. Prothero.
51	" Tredegar	"	Powell Duffryn Steam Coal Company (Limited).
52	" Tredegar Level Colliery	"	" "
53	Pantglaes	"	Thomas Morgan.
54	Plas Bedwellty	"	Trustees of late Thomas Prothero.
55	Pontypool Works	Pontypool	Ebbw Vale Company (Limited).
56	Price's Tylery	Newport	John Jayne.
57	Rhiwpark Abertillery	"	William Stewart.
58	Rhos Wen	"	Messrs. Bevan and Fryce.
59	Rhymney Works	"	Rhymney Iron Company.
60	Risca Black Vein	"	T. W. Rhodes.
61	" Rock Vein	"	"
62	Rock	"	Rock Coal Company.
63	Sirhowy Works	"	Ebbw Vale Company (Limited).
64	Spelter and Gellyhave	Maesewmmer	Reuben Turner.
65	Tillery and Cwm Nant-y-groes Collieries.	"	Clapp and Williams.
66	Tillery Level	Near Newport	John Jayne.
67	Tredegar	Tredegar	Tredegar Iron Company.
68	Trelyn	Newport	Trelyn Coal and Coke Company.
69	Tyr Filkins	"	H. and W. Powell.
70	Victoria Works	Pontypool	Jno. Vipond and Company (Limited).
71	Varteg Works	"	Partridge and Jones.
72	Varteg Hill Colliery	Newport	Ebbw Vale Company (Limited).
73	White Rose	"	George Pell.
	On the Edge of GLAMORGANSHIRE.		
1	Bute Works	Rhymney	Rhymney Iron Company.
2	Carngethin	Newport	Carngethin Coal Company.
3	Cil Haul	Merthyr Tydfil	Bargoed Coal Company (Limited).
4	Deri Newydd	Rhymney	Lewis, Jones, and Lewis.
5	Energlyn	Caerphilly	Energlyn Coal Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
6	Glan ddu	Newport	Latch and Cope.
7	Gwladis	Cardiff	Christopher James.
8	Gwain-y-Barra and Pantglass	Caerphilly	Cardiff and Newport Coal Company.
9	Graig Rhymney	Newport	Rhymney Iron Company.
10	Hendre Denny	Cardiff	David and Sloper.
11	Hengoed	"	Thomas and Lewis.
12	Libanus	Blackwood	Trustees of late Thomas Prothero.
13	New Brithdir	Rhymney	Thomas Joseph and Company (Limited).
14	New Rhos	Cardiff	William Lewis and Company.
15	Pen-y-Cappel	Caerphilly	George Williams.
16	Tyr Gibbon	"	Energlyn Company.
17	Tyr Phil.	Rhymney	Rhymney Iron Company.
18	Troedyrhiw-vuch	"	Charles Hollwey and Company.
19	Old Brithdir	"	P. T. Woodruffe and Company.
20	Rhos Llantwit	Near Caerphilly, Glamorganshire	Rhos. Lantwit Coal Company.
21	Wern Ddu or Van Colliery	Caerphilly	Glamorgan Company (Limited).

NORTH WALES.

H.M. Inspector, PETER HIGSON, Manchester.

FLINTSHIRE.

1	Argoed Hall	Buckley, Mold	The Argoed Hall Colliery Company (Limited).
2	Aston Hall	Ewloe, Mold	The Aston Hall Coal Company (Limited).
3	Bistree	Buckley	Tomkinson and Company.
4	Broncoed	Mold	North Wales Coal, &c. Company (Limited)
5	Bromfield	"	Wm. Southall.
6	Buckley, South	Buckley	South Buckley Coal and Fire-brick Company.
7	Calico	Mold	Peter Muckleston.
8	Coed Talon	"	Coed Talon Coal Company (Limited).
9	Coppa	"	Griffiths Brothers.
10	Coleshill	Bagilt	William Jones and Company.
11	Englefield and Trevor	Holywell	" "
12	Ewloe Hall	Buckley	Ewloe Hall Coal Company.
13	Flint Marsh	Flint	The Flint Marsh Coal Company.
14	Galchog and Northop	"	Galchog and Northop Colliery Company.
15	Great Oak	Buckley	The Buckley Colliery Company.
16	Leeswood Hill	Mold	The North Wales Coal Oil Company (Limited).
17	Leeswood Green	"	Leeswood Green Cannel Company (Limited).
18	Leeswood Main	"	Leaswood Main Coal and Cannel Company.
19	Little Mountain	Buckley	Rose, Plant, and Company.
20	Mold	Mold	The Mold Colliery Company.
21	Mostyn	Mostyn	The Mostyn Coal Company.
22	Nant Mawr (not at work)	Buckley	The Nant Mawr Coal Company (Limited).
23	Nerquis	Mold	Nerquis Coal and Cannel Company.
24	Parsonages	Buckley Mountain	Parsonages and Company.
25	Pontybodkin	Tryddin Mold	The London, Leeswood, and Erith Mineral Oil Company (Limited).
26	Hanmer	Mostyn	Eyton and Elliot.
27	Spon Green	Buckley	William Hancock.
28	Tryddyn	Mold	Flintshire Oil and Cannel Company.
29	Tryddyn Farm	"	" "
30	Queen's Ferry	Queen's Ferry	Queen's Ferry Coal Company.
31	Wern	Bagillt, Holywell	David Jones.
32	Wylva	Mold	The Bronwhlyn Colliery Company.

DENBIGHSHIRE.

1	Afoneitha	Ruabon	Robert Williams and Company.
2	Bersham	Wrexham	(*Suspended.*)
3	Black Park	Chirk	John Stott, Milne, and Company.
4	Broughton Hall	Wrexham	Broughton Coal Company.
5	Brymbo	"	Brymbo Coal Company.
6	Bryn Kinalt	Chirk	Brynkinalt Coal Company.
7	Bryn Malley	Wrexham	Thomas Clayton.
8	Bryn-yr-Owen	Ruabon	John Taylor and Sons.
9	Caepenty	Wrexham	Powell, Williams, and Jones.
10	Christionydd	Ruabon	Robert Williams and Company.
11	Talwon	Wrexham	R. O. & I. Burton.
12	"	"	Samuel Jones and Company.
13	Frood	"	Sparrow and Poole.
14	Gardden Lodge	Ruabon	Gardden Lodge Colliery Company.
15	Gardden	"	Ruabon Coal Company (Limited).
16	Hafod Colliery	"	The Ruabon Coal Company.
17	Llwyninnion	Wrexham	The Llwyninnion Company.
18	Minera Colliery	Coed Beth	The Minera Coal Company.
19	Pentre Bychan	Ruabon	John Taylor and Company.
20	Pentre Saison	Minera	The Pentre Saison Coal Company.
21	Plaskynaston	Cefn, Ruabon	Plaskynaston Coal Company.
22	Plasisa	Ruabon	Samuel Giller.
23	Plas Benion	"	The New British Iron Works Company.
24	Ponkey	"	Ruabon Coal Company (Limited).
25	Ruabon Colliery	"	Ruabon Coal and Coke Company.
26	The Square	"	The Square Coal Company.
27	Vron	Wrexham	Maurice and Low.
28	Westminster Brymbo	"	Westminster Brymbo Coal Company.
29	Wrexham	"	The Wrexham Coal Company (Limited).
30	Wynn Hall	Ruabon	The Wynn Hall Coal Company.
31	Wynnstay	"	New British Iron Company.

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No.	Name of Colliery.	Where situated.	Owner's Name.
	ANGLESEY.		
1	Berw	Llanidan, Berw	Anglesey Coal Company.
2	Pont Marquis	Trefdiaith, „	Rechard Griffiths.

SOUTH WALES.

H.M. Inspector, THOMAS E. WALES, Swansea.

PEMBROKESHIRE.

1	Ainkell, Redbath, and Bolton Hill.	Haverfordwest	J. Williams.
2	Begelly	Narberth	Broadmoor Anthracite Coal Company (Limited).
3	Bonville Court Works	„	Myers and Company.
4	Broadmoor	„	Broadmoor Anthracite Coal Company.
5	Broadhaven Slash	„	Thomas and Canton.
6	Cardmaker's Pool	„	Enoch Barrah.
7	Folkeston and Trevane	„	Thomas and Canton.
8	Foxhill	„	Canton and Thomas.
9	Hook	„	Thomas Harcourt Powell.
10	Kilgetty Works	Tenby	Vickerman and Company.
11	Moreton	„	Williamson and Company.
12	Nolton	Haverfordwest	James Barrah.
13	Shipping	Tenby	Joseph Cadman.
14	Southwood	Haverfordwest	Walters and Canton.
15	Swansell	„	Canton and Thomas.
16	Thomas Chapel Works	Tenby	Pembrokeshire Iron and Coal Company.

CAERMARTHENSHIRE.

1	Amman	Llanelly	Amman Iron Company.
2	Begui	„	John Griffiths and Company.
3	Biggin	„	Walter Hugh and Company.
4	Blyneau	„	Williams and Company.
5	Box	„	Sims, Williams, Neville, and Company.
6	Bryhamman Works	„	Francis and Strick.
7	Bryn-Gwyn	„	Sims, Williams, Neville, and Company.
8	„	„	Smith and Phillips.
9	Bynea	„	Sims, Williams, Neville, and Company.
10	Carbryn	„	Penry and Williams.
11	Caebrin	„	Williams and Company.
12	Cae Vrin	„	„ „
13	Carway	„	Carway and Duffryn Coal Company.
14	Cefn Caen	„	Harris and Company.
15	Clynboydy	„	J. Strick.
16	Cross Hands	„	Norton and Company.
17	Cwmamman Works	„	Morgan and Sons.
18	Cwmllynfell	„	James and Aubray.
19	Cwm Mawr	„	Rev. Parry Thomas.
20	Cwm Capel	„	Mason and Elkington.
21	Cwmfelui	„	John Francis.
22	Cwmtwrch	„	Evan Jones.
23	Cwm Garnant	„	James and Aubrey.
24	Dyffryn	„	J. Strick.
25	Garnant	„	Perkins and Sons.
26	Gelly	„	Sims, Williams, Neville, and Company.
27	Gemven	„	„ „
28	Gelly Ceidrim	„	Exors. of late Joseph Martin.
29	Glascurta	„	
30	Glangwendraeth	„	William Evan.
31	Gorse	„	Sims, Williams, Neville, and Company.
32	Gorsgoch	„	Gorsgoch and Rhos Company.
33	Gwendraeth	„	Daniel Watney.
34	Incline	„	Joseph Everett.
35	Llandafen	„	Sims, Williams, Neville, and Company.
36	Llangennech	„	Thos. J. Margrave.
37	Llwynhendy	„	John Francis.
38	Maehynys	„	Harris and Company.
39	Maesyquarrey	„	Williams and Company.
40	Mynydd Mawr	„	Norton and Company.
41	Mynyddsyllen	„	„
42	„	„	Isaac Griffiths.
43	New Lodge	„	New Lodge Coal Company.
44	Oldcastle	„	Sims, Williams, Neville, and Company.
45	Pant-y-fynon	„	David Lloyd.
46	Pencoed	„	Sims, Williams, Neville, and Company.
47	Pontyclerc	„	David Evans and John Lloyd.
48	Pwyl-lord	„	David Lloyd.
49	Pwllynewydd	„	Morgan Saunders.
50	Rhoes	„	Messrs. Crawley and Company.
51	Rhos	„	Gorscoch and Rhos Company.
52	St. George's	„	Thos. J. Margrave.
53	Star	„	Henry Pratt.
54	Techion	„	Sims, Williams, Nevill, and Company.
55	Trichwart Ponthenry	„	Everett and Company.
56	Tumble Colliery	„	Evans and Company.
57	Victoria	„	Harris and Company.
58	Waincaegerwen	„	Morgan and Thompson.
59	Waun Thomas	„	William Clement and Company.
60	Ynishafen	„	Joseph Everett.

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No.	Name of Colliery.	Where situated.	Owner's Name.
		GLAMORGANSHIRE.	
1	Aber	Bridgend	Nicholson and Taylor.
2	Aberamman	Aberdare	Powell Duffryn Steam Coal Company (Limited).
3	Abercannaid	Merthyr Tydvil	Plymouth Iron Company.
4	Abercrave	Swansea	British Iron Company.
5	Abercwmboy	Aberdare	David Davis and Sons.
6	Aberdare	"	Aberdare Iron Company.
7	Abergwawr	"	Powell Duffryn Steam Coal Company (Limited).
8	Abergorchi	Rhondda Valley	George Insole and Son.
9	Abernant	Aberdare	R. Fothergill and Company.
10	Abernantygroes	"	Powell Duffryn Steam Coal Company (Limited).
11	"	"	R. Fothergill and Company.
12	Abeerprgwym	Neath	W. Williams.
13	Alltwen	Swansea	Alfred Sterrey.
14	Avon Vale	Briton Ferry	Elford, Donague, Williams, and Thomas.
15	Bagden	Swansea	Thomas and Williams.
16	Bargoed Rhymney	Merthyr	Thomas Joseph.
17	Bettws	Bridgend	Thos. Hopkins.
18	Berrington	Swansea	Kirkwood and Morgan.
19	Birchgrove	"	Pegg and Company.
20	Bishwell	"	Royal Forest of Dean Coal Company.
21	Blaenclydach	Rhondda	Wm. Perch and R. H. Miers.
22	Blaengwawr	Aberdare	David Davis and Sons.
23	Blaengwrach	Neath	N. V. E. Vaughan.
24	Blaenant	Aberdare	Fothergill and Company.
25	Bodringallt	Rhondda	Jones and Simpson.
26	Brithdir	Gellygaer	Dunraven United Collieries Company (Limited).
27	Broadoak	Broadoak	Broadoak Colliery Company.
28	Brombill	Taibach	Vivian and Sons.
29	Bryncoch	Neath	Neath Abbey Coal Company.
30	Bryndewy	"	Duffryn Main Colliery Company.
31	Bryndu Works	Pyle	Bryndû Coal and Coke Company.
32	Bryn	Taibach	Governor and Company of Copper Mine.
33	Brynna Gwynnon	Bridgend	Exors. of Clark Irving.
34	Bryn Willock	Swansea	H. H. Vivian, Esq., M.P.
35	Bute Merthyr	Pontypridd	Marquis of Bute.
36	Bwllfa	Aberdare	Bwllfa Company (Limited).
37	Bwllfa	Pontypridd	R. Fothergill and Company.
38	Caedû	Bridgend	John Brogden and Sons.
39	Caergynydd	Swansea	Trevor A. Williams.
40	Caethelid	"	—Vivian.
41	Calvert	"	Trevor Williams.
42	Camlyn	Aberdare	Crawshay Bailey.
43	Castelwiver	"	William Davis,
44	Cathelid	Swansea	Vivian and Sons.
45	Cefn	Bridgend	G. S. Ford and Sons.
46	Cefn Cwsc Works	Aberdare	Rees Williams.
47	Cefn Merthyr Colliery	"	London and Merthyr Steam Coal Company (Limited).
48	Cefn Pennar Level	"	Rees Williams.
49	Cethin	Merthyr	R. T. Crawshay.
50	Church	Cwm Rhondda	Greenhill and Company.
51	Clydach	"	Daniel and Edmund Thomas.
52	Clynwood	Swansea	Clynwood Coal Company.
53	Coalbrook	Loughor	Coalbrook Coal Company.
54	Coedcae	Pontypridd	Coedcae Coal Company.
55	Coed-y-bedw	Cardiff	T. W. Booker and Company.
56	Colleuna	Ely Valley	—Prichard.
57	Court Herbert	Neath	Dynevor Coal Company.
58	Craig-y-rallt	Cardiff	T. W. Booker and Company.
59	Cwm	Swansea	Vivian and Sons.
60	Cwmamman	Aberdare	Shepherd and Evans.
61	Cwm Avon Works	Tailbach	Governor and Company of Copper Mines.
62	Cwmnantyllyd	Swansea	Primrose Coal Company.
63	Cwm Velin	"	Yniscedwyn Coal Company (Limited).
64	Cwmbargoed	Merthyr Tydfil	Dowlais Iron Company.
65	"	"	"
66	Cwm Bach	Swansea	John Thomas.
67	Cwmdû	Neath	Dynevor Coal Company.
68	"	Bridgend	John Brogden and Sons.
69	"	"	"
70	Cwmgrach	Neath	N. V. E. Vaughan.
71	Cwmneol	Aberdare	Powell Duffryn Steam Coal Company (Limited).
72	Cwmpennar	"	" "
73	" Lower	"	" "
74	Cyfarthfa Works	Merthyr Tydvil	R. T. Crawshay.
75	Cyfing	Swansea	The Ystalyfera Iron Company.
76	Cymmer	Rhondda	George Insole and Sons.
77	Cymmer Level	"	T. C. Hind.
78	Deep Dyffryn	Aberdare	Nixon, Taylor, and Company.
79	Duffryn, Upper	"	Powell Duffryn Steam Coal Company (Limited).
80	" Middle	"	" "
81	" Lower	"	" "
82	Duffryn Dare	"	" "
83	Dunraven	Pontypridd	Dunraven United Collieries Company (Limited).
84	Dunvant	Swansea	Dunvant Coal Company.
85	Eagles Bush	Neath	J. B. Williams.
86	Earlswood	Briton Ferry	George Tissington.
87	Eakyn	Neath	George Penrose.
88	Ferndale	Aberdare	David Davis and Sons.
89	Forest	Swansea	Richard and Glashrook.

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No.	Name of Colliery.	Where situated.	Owner's Name.
90	Forest	Aberdare	Rd. Fothergill.
91	Fforchamman	"	Powell Duffryn Steam Coal Company (Limited).
92	Gadlys Works	"	Gadlys Iron Company.
93	Garth	Swansea	John and Thomas Glasbrook.
94	Gelligaer	Merthyr Tydfil	Thomas Powell.
95	Gelly-galed	Rhondda	Crawshay Bailey.
96	Gellyvy	Ely	Limited.
97	Gethin	Merthyr Tydfil	R. T. Crawshay.
98	Glamorgan	Pontypridd	Glamorgan Coal Company.
99	Glan Mychydd	Llantrissant	Earl of Talbot and Shrewsbury.
100	Glynfach	Rhondda	Greenhill and Company.
101	Glynog	Llantrissant	Glynog Coal Company.
102	Gorwydd	Swansea	Alfred Sterry.
103	Graig	Merthyr Tydfil	Robert Rees and others.
104	Graig-y-cwm	Swansea	J. J. Strick.
105	Graigola	"	Benson and Smith.
106	Gwain Clawdd	"	The Ystalyfera Iron Company.
107	Gyfeillon	Rhondda	Great Western Company (Limited).
108	Hafod	"	J. Calvert and Rowlands.
109	Hendreladis	Swansea	Yniscedwyn Iron Company.
110	Hirwain Works	Aberdare	Hirwain Coal and Iron Company (Limited).
111	Hirwain	"	" "
112	Lantwit Heol Ddu	Pontypridd	Evan Morley.
113	Llanalais	Penclawdd	J. R. Vivan.
114	Llanlay	Llantrissant	N. V. E. Vaughan.
115	Llanmorlais	Penclawdd	R. B. Christopher.
116	Lone	Swansea	J. J. Strick.
117	Landore	"	Cory, Yeo, and Company.
118	Lan Level	Cardiff	T. W. Booker and Company.
119	Lletty Shenkin	Aberdare	Lletty Shenkin Coal Company.
120	Llancaich	Pontypridd	G. S. Worthington.
121	Llansamlet	Swansea	C. H. Smith.
122	Llantwit Works	Llantrissant	Exors. of Thomas Powell.
123	Llwyncelyn	Pontypridd	Christopher James and Company.
124	Llwyn-y-beddu	Swansea	J. P. Budd and Company.
125	Llynvi Works	Bridgend	Llynvi Iron Company.
126	Logins	Swansea	Trevor Williams.
127	Lower Four Feet	Merthyr	Dowlais Iron Company.
128	Maes y Marchog	Neath	Penrose and Starbuck.
129	Maesteg Works	Bridgend	Llynvi Vale Iron Company.
130	Main	Neath	Duffryn Main Colliery Company.
131	Maindy	Pontypridd	Davies and Company.
132	"	"	D. Davies and Company.
133	Maindy Colliery	"	" "
134	Melincourt	Neath	Thomas and Company.
135	Merthyr	Rhondda Valley	George Insole and Son.
136	" Dare	Aberdare	Rhys and Company.
137	Morfa	Taibach	Vivian and Sons.
138	Mountain Ash Level	Aberdare	Richard Fothergill.
139	Mynydd bach-y-glo	Swansea	Alfred Sterry.
140	" bach-y-pishwell	"	Silvanus Padley and Company.
141	Mynydd Newydd	"	Vivian and Sons.
142	Nantymelin	Aberdare	Mordecai Jones.
143	Navigation	"	Nixon, Taylor, and Company.
144	New Brige	Pontypridd	Fowler Brothers.
145	Nixon's Graigola	Swansea	Nixon and Bell.
146	Oakwood	Taibach	Governor and Company of Copper Mines.
147	Ogwr fach	Pontypridd	Evan Evans.
148	Onwllyn	Neath	James Evans.
149	Palleg (Brecknockshire)	Swansea	E. Dering.
150	Pantygraig	Neath	Penrose and Starbuck.
151	Park	Bridgend	John Brogden and Sons.
152	"	Pontypridd	D. Davies and Company.
153	"	"	Dd. Davis and Company.
154	Partheglisson	Merthyr	Jones and Beddoe.
155	Penclawdd	Swansea	William Lambert.
156	Pennar	Aberdare	Powell Duffryn Steam Coal Company (Limited).
157	Penrhiewfer	Ely Valley	Penrhiewfer Coal Company.
158	Pentre	Rhondda	Greenhill and Company.
159	" 4 ft.	Pontypridd	"
160	" Colliery	Swansea	Vivian and Sons.
161	Peentrefelin	"	"
162	" Colliery	"	"
163	Pentyrch Works	Cardiff	T. W. Booker and Company.
164	Penycraig	Ely Valley	Penycraig Coal Company.
165	Penydarran Works	Merthyr Tydfil	Dowlais Iron Company.
166	Plymouth Works	"	Plymouth Iron Company.
167	Pontycynon	Aberdare	Philip Davies.
168	Pontypridd	Pontypridd	Calvert and Rowland.
169	Porth	"	C. James.
170	Primrose	Neath	Primrose Coal Company.
171	Pwllfaron	"	Neath Abbey Coal Company.
172	Pwllhowele	Pontypridd	W. and T. Davis.
173	Resolven	Neath	Sir Ralph Howard, Bart.
174	Respidge	Aberdare	W. Crawshay and Sons.
175	Rhas Las	Merthyr	Dowlais Iron Company.
176	Rhiwbritwell	Llantrissant	Hautwip Main Colliery Company.
177	Rhyd-yr-helyg	Cardiff	T. W. Booker and Company.
178	Rhydydefed	Swansea	William Evans and Company.
179	Rhywsaison	Llantwit	William Lewis.
180	Scuwain	Bridgend	Thomas Morgan.
181	Squborwen	Aberdare	Samuel Thomas.

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No.	Name of Colliery.	Where situated.	Owner's Name.
182	Swan	Briton Ferry	Thomas and Company.
183	Tewgoed	Neath	Margam Tin Plate Company.
184	Tonmawr	"	Weymouth and Green.
185	Top Hill	Cardiff	W. S. Cartwright.
186	Tor y mynydd	Taibach	Margram Tin Plate Company.
187	Troedyrhiw	Merthyr	Cope, Lewis, Thomas, and Collindon.
188	" Pits	Rhondda	Jones and Thomas.
189	Tycenol	"	Williams, Foster, and Company.
190	Tydran	Swansea	Thomas and Beddows.
191	Tygwyn	"	Young and Polland.
192	Tylecoch	Pontypridd	Thomas Jones.
193	Tynewydd	Bridgend	John Brogden and Sons.
194	Tywith	"	"
195	Van	Cardiff	J. Edmonds.
196	Venalt	Neath	Aberdare Iron Company.
197	Vochriew Level	Gellygaer	Dowlais Iron Company.
198	" Colliery, No. 1	Merthyr	"
199	Wain-main-hir do., No. 2	"	David Williams and Company.
200	Wenallt	Neath	Joshua Williams and Company.
201	Wern Plumies	Swansea	The Ystalfera Iron Company.
202	Waunmiskin	Llantrissant	Aberdare Iron Company.
203	Waunwyllt	Aberdare	Graig Coal Company.
204	Wawn Claudd	Swansea	J. P. Budd and Company.
205	Wenfawr	"	Rev. S. Pugh.
206	Werfa	Aberdare	Heath, Evens, and Company.
207	Wern-ddu	Swansea	W. Gilbertson.
208	"	"	Primrose Coal Company.
209	Worcester	"	Thomas Glasbrooke.
210	"	"	"
211	Wyndham	Bridgend	John Brogden and Sons.
212	Ynysarwed	Neath	Penrose and Starbuck.
213	Ynyscedwyn Works	Swansea	Ynescedwin Iron Company (Limited).
214	Ynyshir	Rhondda fach	Francis Crawshay.
215	Ynysveio	Rhondda fawr	Troedrhiew Coal Company.
216	Ynyscynon	Aberdare	Powell Duffryn Steam Coal Company (Limited).
217	Ynysgeinon	Swansea	Thomas Walters.
218	Ystalfera Works	"	Ystalyfera Iron Company.

SCOTLAND.

WESTERN DISTRICT; *Inspector*, WILLIAM ALEXANDER, Glasgow, comprising the Counties of Ayr, Dumfries, Dumbarton, Renfrew, West Division of Stirling, and Lower Ward and Parish of Old Monkland in Lanarkshire.

LANARKSHIRE.

1	Balornock	Glasgow	James Dunlop and Company.
2	Bishopbriggs	"	William Dixon.
3	Blackhill	"	Wilsons and Company.
4	Calder	"	Carron Company.
5	Govan	"	William Dixon.
6	Jordanhill	"	Monkland Iron Company's Trustees.
7	Kelvinside	"	Montgomery and Fleming.
8	"	"	Adie and Rankine.
9	Kenmure	"	Wilsons and Company.
10	Keppoch	"	"
11	Possil	"	"
12	Robroystone	"	James Dunlop and Company.
13	Rockhill	"	Wilsons and Company.
14	Rutherglen Muir	"	William Dixon.
1	Cambuslang	Rutherglen	Archibald Russell.
2	Eastfield	"	T. G. Buchanan.
3	Farm	"	James Fairrie.
4	Fullarton	"	James Dunlop and Company.
5	Newton	"	Newton Colliery Company.
6	Rosebank	"	James Dunlop and Company.
7	Silverbank	"	James Fairrie.
8	Stonelaw	"	J. R. Reid.
1	Garthamlock	Shettleston	J. Panton.
2	Greenfield	"	M'Nair, Stokes, and Dixon.
3	Kenmuir	"	Jas. Dunlop and Company.
4	" Hill	"	John Horne.
5	Kennyhill	"	Robert Burns.
6	Lightburn	"	Alex. Rankine.
7	Westmuir	"	R. Gray and Company.
1	Braehead	Ballieston	Charles Tennant and Company.
2	Bredisholme	"	"
3	Cardowan	"	Andrew Yeats and Company.
4	Calderbank	"	Glasgow Iron Company.
5	Craigend	"	Birrel and McIntosh.
6	Drumpark	"	Drumpark Coal Company.
7	Dungeonhill	"	Forrester and Robson.
8	Easterhouse	"	James Merry.
9	"	"	John Young.
10	Ellismuir	"	Glasgow Iron Company.
11	Heathery Knowe	"	Heathery Knowe Company.
12	Mount Vernon	"	John Young.
13	Over Possil	"	Wm. Wallace and Company.
14	Provanhall	"	Glasgow Iron Company.
15	Wester Hallhill	"	R. and J. Anderson.
1	Coathill	Coatbridge	Pettigrew and Company.
2	Coats	"	Thomas Jackson.

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No.	Name of Colliery.	Where situated.	Owner's Name.
3	Drumpeller	Coatbridge	Drumpeller Coal Company.
4	"	"	Wilsons and Company.
5	Dundyvan	"	Rob. Hamilton.
6	Espieside	"	Wm. Baird and Company.
7	Gartgill	"	"
8	Gartsherrie	"	"
9	Gunnie	"	"
10	Kirkwood	"	John Hendrie.
11	"	"	Wilsons and Company.
12	Phœnix	"	John Spencer.
13	Rosehall	"	Robert Addie and Sons.
14	Sunnyside	"	Wm. Baird and Company.
15	Souterhouse	"	John Gillan.
1	Calder Iron Works	Airdrie	Wm. Dixon.
2	Clifton Hill	"	Clifton Hill Coal Company.
3	Faskine	"	Wm. Baird and Company.
4	*Monkland	"	Monkland Iron Company.
5	Palacecraig	"	Wm. Baird and Company.
	AYRSHIRE.		
1	Ayr	Annbank	J. T. Gordon.
2	Bargainie	Maypole	Countess of Stair.
3	Dalharco	Ayr	Dalmellington Iron Company.
4	Dalquharran	Maybole	Hon. T. F. Kennedy.
5	Dalzielsie	"	James Couper.
6	Dounieston	Ayr	Dalmellington Iron Company.
7	Dutchray	"	Joseph Brydon and Company.
8	Minivie	"	Dalmellington Iron Company.
1	Alnwick Lodge	Irvine	Merry and Cunningham.
2	Armsheugh	"	" "
3	Ardeer Iron Works	Stevenstone	" "
4	Auchinharvie	"	Kenneth and Whitfield.
5	Bartonholm	Kilwinning	Eglinton Iron Company.
6	Blair Iron Works	Dalry	" "
7	Boutreehill	Dreghorn	Archd. Finnie and James Finlay.
8	Burgh	Irvine	A. G. Simpson.
9	Caldwell	Beith	Armour and Fulton.
10	Cauldhame	Kilmarnock	Archd. Finnie and Sons.
11	Court Hill	Beith	Merry and Cunninghame.
12	Doura	Irvine	John Barr and McJannet.
13	Dreghorn	Dreghorn	Arch. Kenneth and Sons.
14	Eglinton	Kilwinning	" "
15	" Iron Works	"	Eglinton Iron Company.
16	Fergushill	"	Arch. Fennie.
17	Glengarnock Iron Works	Beith	Merry and Cunninghame.
18	Mount Curr	Kilwinning	Eglinton Iron Company.
19	Perceton*	Irvine	Messrs. Craig's.
20	"	"	Merry and Cunninghame.
21	Redburn	Kilwinning	Eglinton Iron Company.
22	Redstone	Irvine	Armour and Fulton.
23	Roughwood	Beith	Crawford and Sneddin.
24	Springhill	Kilmarnock	Archd. Finnie and Sons.
25	Stevenson	Stevenson	Merry and Cunningham.
26	Swineridge Muir	"	" "
1	Bankhead	Kilmarnock	Portland Iron Company.
2	Barleith	"	John Galloway.
3	Bogside	"	J. Dickie.
4	Bonnyton	"	Merry and Cunninghame.
5	Burnbank and Ladyton	Galston	Boyd, Gilmour, and Company.
6	Busbie	Kilmarnock	Archibald Finnie.
7	Carnilbank	"	"
8	Carperington	"	Wm. Smith Cunninghame.
9	Dollar	"	John Galloway.
10	Drummuir	"	Merry and Cunninghame.
11	Dykehead	"	Portland Iron Company.
12	East Thornton	"	Archibald Finnie.
13	Galston	Galston	John Horne.
14	Gauchland	"	Kinloch and Company.
15	Grange	Kilmarnock	R. Yeats and Company.
16	Grougar	"	Portland Iron Company.
17	Hillhead	"	J. and M. Craig.
18	Hurlford	"	John Howie.
19	"	"	Allan, Gilmour, and Company.
20	Holmes	Galston	John Horne.
21	Kilmarnock	Kilmarnock	Archibald Finnie and Son.
22	Maxwood	Galston	W. and D. Roxburgh.
23	Mayfield	Kilmarnock	Allan, Gilmour, and Company.
24	Overton	"	Merry and Cunningham.
25	Paddocklaw	"	" "
26	Portland	"	Allan, Gilmour, and Company.
27	Portland Iron Works	"	Portland Iron Company.
28	Plan	"	McKnight and Company.
29	Treesbank	"	Wm. S. Cunningham.
30	West Thornton	"	Archibald Finnie.
31	Warrick Hill	"	Merry and Cunningham.

* Monkland Iron Company have pits at Monkland in this district, called Monkland or Peep o'Day.
* Perceton and Hillhead Collieries are in different districts of Ayrshire.

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No.	Name of Colliery.	Where situated.	Owner's Name.
1	Ashyard	Kilmarnock	Dunlop and Eaglesham.
2	Bank	New Cumnock	The Bank Coal Company.
3	Coalburn	"	J. McNicol.
4	Common	Old Cumnock	Portland Iron Company.
5	"	Auchinleck	William Walker.
6	Cronberry	Cumnock	Wm. Baird and Company.
7	Crossflat	Muirkirk	" "
8	Cumnock	Cumnock	Portland Iron Company.
9	Garrallan	Old Cumnock	James Eaglesham.
10	Gillsmillcrofts	"	Watchman and Company.
11	Glenbuck	Muirkirk	Wm. Baird and Company.
12	Glenlogan	Cumnock	Portland Iron Company.
13	Goatfoot	Galston	Boyd, Gilmour, and Company.
14	Lanemark	Cumnock	Lanemark Coal Company.
15	Loudon	"	Portland Iron Company.
16	Lugar Iron Works	Old Cumnock	Wm. Baird and Company.
17	Mansfield	New Cumnock	Jas. Gray.
18	Muirkirk Iron Works	Muirkirk	Wm. Baird and Company.
19	Pathhead	New Cumnock	Archibald Gray and Company.
20	South Boig	"	Lanemark Coal Company.
21	Strade	Cumnock	" "
22	Wellwood	Muirkirk	Wm. Baird and Company.
	WESTERN DIVISION OF STIRLINGSHIRE.		
1	Alva	Alva	James Johnstone.
2	Auchinbowie	Stirling	Buchanan and Forsyth.
3	Balmalloch	Kilsyth	Brown and Rennie.
4	Banknock	Denny	William Wilson.
5	Bannockburn	Stirling	Alexander Geddes' Heirs.
6	Campsie	Lennoxtown	Hurlet and Campsie Alum Company.
7	Connypark	Kilsyth	John Barr.
8	Cuttiemyre	"	W. Baird and Company.
9	Dennymill	Denny	" "
10	Glorrat	Lennoxtown	J. Lynch.
11	Highland Park	Kilsyth	Brown and Rennie.
12	Ingleston	Denny	W. Baird and Company.
13	Kilsyth	"	" "
14	Neilston	"	James Wallace and Company.
15	Orchard	"	Walker and Young.
16	Plean	Stirling	East Plean Coal Company.
17	Queenzie	Kilsyth	John Bow and Company.
18	Riskend	"	W. Baird and Company.
19	Scalliongow	Lennoxtown	James Allan.
20	Townhead	Kilsyth	W. Baird and Company.
21	Twechar	Denny	" "
22	West Plean	Stirling	Moyes, Smith, and Co.
	DUMBARTONSHIRE.		
1	Baljaffray	Duntocher	John Davidson's Heirs.
2	Blairdardie	Renfrew	James Robertson.
3	Braes O Yetts	Kirkintilloch	Thos. Fell.
4	Croy	Kilsyth	Wm. Baird and Co.
5	Garscube	Maryhill	McNair, Stokes, and Dixon.
6	Garscadden	"	Merry and Cunningham.
7	Gartshore	Kilsyth	Wm. Baird and Company.
8	Knightswood	Maryhill	Wilson and Company.
9	Meiklehill	Kirkintilloch	James Gardner and Sons.
10	Netherwood	Kilsyth	John Watson and Sons.
11	Strone	"	R. Brown.
12	Solesgirth	Kirkintilloch	J. Wallace and Co.
	RENFREWSHIRE.		
*1	Blytheswood	Renfrew	R. Addie and Sons.
2	Corkerkill	Pollockshaws	W. S. Dixon.
3	Drumoin	Govan	Colin, Dunlop, and Co.
4	Fulton	Johnston	J. Greenshields and Son.
5	Ibroix	Govan	W. S. Dixon.
6	Linwood	Johnston	Merry and Cunninghame.
7	"	"	J. Anderson.
8	Nitshill	Hurlet	Nitshill Coal Company.
9	Quarrelton	Johnston	Ludovic Houstoun.
10	Titwood	Pollockshaws	W. S. Dixon.
11	West Hurlet and Townhead Pits	Hurlet	John Wilson and Sons.
	ARGYLESHIRE.		
1	Drumlemble	Campbelton	J. Smellie and Son.
	DUMFRIESSHIRE.		
1	Cairnburne	Sanquhar	Mrs. Jane Whygham.
2	Canonbie	Dumfries	Duke of Buccleugh.
3	Drumbuie	Sanquhar	Mrs. Jane Whygham.
4	Gateside	"	"

* This is an Ironstone field, but a little coal has been worked.

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No.	Name of Colliery.	Where situated.	Owner's Name.
	EASTERN DISTRICT; *Inspector*, RALPH MOORE, comprising Eastern Division of Lanarkshire, Fifeshire, Clackmannanshire, Haddingtonshire, Edinburghshire, Linlithgowshire, part of Stirlingshire, Peeblesshire, and Perthshire.		
	EASTERN DIVISION OF LANARKSHIRE.		
1	Airdrie and Chapelside	Airdrie	Ferrier and Strain.
2	Arbukle	"	William Black and Sons.
3	Arden	"	Shotts Iron Company.
4	Auchingray	"	William Black and Sons.
5	Bellsdyke and Springwells	"	Dundas Simpson.
6	" "	"	Shaw and Pettigrew.
7	Brachead	"	Charles Tennant and Company.
8	Chapell Hall	"	Monkland Iron and Steel Company.
9	Clarkstone	"	Johnston and Wilson.
10	Cotton Mill	"	John Brown.
11	Dalmacanter	"	Robert Galt, junr.
12	Darngavel	"	Patrick Rankin.
13	Drumgrayhill	"	Drumgray Coal Company.
14	Dykehead	"	Henry Walker.
15	Greendykeside and Roughrigg	"	Forrester and Robson.
16	Greengairs	"	J. Russell.
17	Kipps	"	Robertson and Eadie.
18	Knackerty	"	John Stewart and Company.
19	Landrigg	"	Forrester and Robson.
20	Meadowfield	"	W. Black and Son.
21	Meadowhead	"	
22	Nettlehole	"	William Smith.
23	Orbiston	"	Mosseno Iron Company.
24	Raebog	"	J. A. McCallum.
25	Riggend	"	J. Napier.
26	Rochsoles	"	Jas. Struthers and Company.
27	Rochsolloch	"	William Cowie.
28	Rosehall	"	Robert Addie and Sons.
29	Roughcraig	"	William Forsyth.
30	Spring Bank	"	John Meason.
31	Stepends	"	Wilsons and Company.
32	Stanrigg	"	William Black and Sons.
33	Thrushbush	"	Thrushbush Coal Company.
34	Whitehill	"	Henderson and Dimmack.
35	Whiterigg and Brownyside	"	William Black and Sons.
36	Woodhall	"	Merry and Cunninghame.
1	Carfin	Holytown	Wm. Dixon.
2	"	"	A. G. Simpson.
3	Carnbroe	"	Merry and Cunninghame.
4	Cleland	"	Wm. Dixon.
5	"	"	Monkland Iron and Steel Company.
6	"	"	Trustees of late Robert Stewart.
7	Greenhill	"	Robert Young.
8	Lahope	"	Thos. Stevenson and Sons.
9	Lawhope	"	Monkland Iron and Steel Company.
10	Langbyres	"	Trustees of late Robert Stewart.
11	Legbrannock	"	Monkland Iron and Steel Company.
12	Milnwood	"	John Christie.
13	Mossend	"	Mossend Iron Company.
14	Shaws and Midhill	"	Hurl, Young, and Company.
15	Stevenson	"	Stevenson Coal Company.
16	Thankerton	"	Monkland Iron and Steel Company.
17	Wyndedge	"	Robert Dick.
1	Braidhurst	Motherwell	Gavin Addie.
2	Craigneuk	"	Merry and Cunninghame.
3	Dalziel and Shields	"	Wishaw Coal Company.
4	"	"	John McAndrew and Company.
5	"	"	Wilsons and Company.
6	Jerviston	"	"
7	Motherwell North	"	Merry and Cunninghame.
8	Orbiston	"	Mossend Iron Company.
9	Parkhead and Motherwell	"	John Watson.
1	Allanton	Wishaw	Shotts Iron Company.
2	Arden	"	"
3	Aulton	"	Andrew Spencer.
4	Benhar	"	Robert Addie and Sons.
5	Cairneyhead and Hillhousegg	"	Shotts Iron Company.
6	Cambusnethan	"	D. and J. Sneddon.
7	Chapel	"	William Aitken.
8	Clydesdale	"	Archd. Russell.
9	Coltness	"	A. G. Simpson.
10	" Pather	"	William Boyd.
11	" Overton and Shawfield	"	John Wilson.
12	" Iron Works	"	Coltness Iron Company.
13	Glenclelland	"	Kerr and Mitchell.
14	Green	"	Robert Bell.
15	Greenhead	"	Robert Brand.
16	Hartswoodhill	"	George Gray.
17	Morningside	"	Shotts Iron Company.
18	Overton	"	Coltness Iron Company.
19	" Station	"	Joseph Waddell.
20	Shotts Iron Works	"	Shotts Iron Company.
21	Wishaw Green	"	Glasgow Iron Company.
22	" Meadow Head	"	"
23	" Netherjohnstone	"	"

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No.	Name of Colliery.	Where situated.	Owner's Name.
24	Wishaw Overjohnstone	Wishaw	Glasgow Iron Company.
25	„ Ravens Craig	„	„
26	„ Shieldmuir	„	„
27	„ Sunnyside	„	Archd. Russell.
28	„	„	Scott and Gilmour.
29	„	„	Merry and Cunningham.
1	Allanton	Hamilton	Austine and Company.
2	Ashgill	Larkhall	Merry and Cunninghame.
3	Auchinheath	Lesmahagow	Jas. Ferguson.
4	„ and Southfield	„	Nitshill and Lesmahagow Coal Company.
5	Avonhead	New Monkland	Colville and Gray.
6	Bog Colliery	Hamilton	John Watson and Sons.
7	Castlehill Iron Works	Carluke	Shotts Iron Company.
8	Cornsilloch	Larkhall	N. Cochrane and Company.
9	Clough	Carnwath	William Darling's Trustees.
10	Climpy Gas Coal	„	Gray and Paul.
11	Dyke-head	Hamilton	Wilsons and Company.
12	Earnock Muir	„	Wm. Dixon.
13	Farniegair	„	Archd. Russell.
14	Glespan	Douglas	James Swann.
15	Greenfield	Hamilton	Hamilton Coal Company.
16	Haywood	Carnwath	Haywood Gas Coal Company.
17	Haughhead	„	Merry and Cunninghame.
18	Larkhall and Home Farm	Hamilton	Hamilton and Macculloch.
19	Longlee	Lesmahagow	Longlee Coal Company.
20	Maudslie	Carluke	Michael Burns.
21	Merryton	Hamilton	Cochrane and Brand.
22	Quarter	„	Colin, Dunlop, and Company.
23	Raplock	„	Jas. Frew.
24	Rigside	Douglas	James Swan.
25	Shawsburn	Hamilton	Andrew Spencer.
26	Skellyton	„	Hamilton and M'Culloch.
27	Starryshaw and Harthill	„	Muir and Thornton.
28	Swinhill	Larkhall	Dalserf Coal, Coke, and Oil Company.
29	Woodside and Hill	Hamilton	Jas. Smith and Son.
30	Wilsontown Gas Coal	Carnwath	Gray and Paul.

FIFESHIRE.

1	Baldridge	Dunfermline	Mrs. Thomas Grier.
2	Balgonie	Kirkcaldy	Charles Balfour.
3	Beath	Dunfermline	Beath and Blairadam Coal Company.
4	Cappeldrea	Kirkcaldy	Messrs. Aytoun and Anderson.
5	Cardinden	„	Thomas Goodall.
6	Clunie	„	Landale, Boyd, and Company.
7	„	„	Goodall and Herd.
8	Cuttlehill	„	Henderson, Wallace, and Company.
9	Cowdenheath	„	Forth Iron Company.
10	Donibristle	Dunfermline	Nasmyth and Grieve.
11	Dunnieker	Kirkcaldy	Goodall and Herd.
12	Dundonald	Dunfermline	Alex. Naysmith.
13	Dysart	Kirkcaldy	Earl of Rosslyn.
4	Fordel	Dunfermline	G. W. M. Henderson.
5	Foulford	„	Lochgelly Iron Company.
6	Hallbeath	„	Henderson, Wallace, and Company.
17	Hill of Beath	„	Ord Adams.
18	Kelty	„	Beath and Blairadam Coal Company.
19	Lassodie	Kirkcaldy	Lassodie Colliery Company.
24	Lochfitty	Dunfermline	Beath and Blairadam Coal Company.
21	Lochgelly	Kirkcaldy	Lochgelly Iron Company.
22	Lumphinnans	Dunfermline	Lumphinnans Iron Company.
23	Muiredge and Cameron	Kirkcaldy	Bowman and Company.
24	Raith (Little)	Dunfermline	Lochgelly Iron Company.
25	Townhill	„	Townhill Coal Company.
26	Wellwood	„	Thomas Spowart and Company.
27	Wemyss	Kirkcaldy	R. G. E. Wemyss.
28	Whitefield	Dunfermline	Whitefield Coal Company.
1	Balbirnie	Cupar	John Balfour.
2	Crosshill	„	W. and D. Murray.
3	Kellie	„	Walker and Cunningham.
4	Kilmux	„	John Lister.
5	Lochore	Lochgelly	Lochore Gas Coal Company.
6	Pirnie	„	Pirnie Coal Company.
7	Radernie	„	Thomas Lumsden.

CLACKMANNANSHIRE.

1	Alloa	Alloa	Alloa Coal Company.
2	Clackmannan	„	Clackmannan Coal Company.
3	Kennetpans	„	Francis Greer.
4	Sheardale	„	James Wingate.
5	Tillicoultry	„	Tillicoultry Coal Company.

HADDINGTONSHIRE.

1	Elphinstone	Tranent	Durie and Nisbet.
2	Fountainhall	„	Repts. of the late George Henderson.
3	Gladsmuir	„	C. and A. Christie.
4	House of Muir	„	Andrew White.

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No.	Name of Colliery.	Where situated.	Owner's Name.
5	Myles and Prestongrange	Tranent	Sir George G. Suttie, Bart.
6	Penston	„	Deans and Moore.
7	Pencaitland	„	„ „
8	Prestonlinks	„	J. and C. Grieve.
9	Seton	„	John Stevenson.
10	Tranent	„	Snowdown.

KINROSS-SHIRE.

1	Blairadam	Kinross	Beath and Blairadam Coal Company.

EDINBURGHSHIRE.

1	Arniston and Vogrie	Dalkeith	John Christie and Company.
2	Broxburn	Broxburn	Robert Bell.
3	Brunstane Muir	Dalkeith	Sir George Clerk, Bt.
4	Carberry and Elphinstone Tower	Tranent	Deans and Moore.
5	Dalkeith	Dalkeith	Duke of Buccleuch.
6	Drummore	Tranent	Deans and Moore.
7	Edmonstone, Niddry. and Woolmet.	Dalkeith	J. and C. Grieve.
8	Loanhead	Lasswade	Shott's Iron Company.
9	Newbattle	Dalkeith	Marquis of Lothian.
10	Oxenford	„	John Christie.
11	Prestonhall	„	John Wood.
12	Polton	„	Eaglesham.
13	Skelty Muir, Whitehill, and Gorton.	Borthwick	Archd. Hood.
14	Wallyford	Musselborough	C. and A. Christie.

LINLITHGOWSHIRE.

1	Armadale	Bathgate	Monkland Iron Company.
2	Balbardie	„	Henry Walker and Son.
3	Bathville	„	John Watson and Sons.
4	Benhar	„	George Simpson.
5	Boghead, Hopetoun, and Torbanehill.	„	James Russell and Son.
6	Crofthead	„	Coltness Iron Company.
7	Fauldhouse	„	Thomas Thornton.
8	Grange	Linlithgow	Henry Cadell.
9	Hilderston	Bathgate	James Inglis.
10	Kinneil	Linlithgow	George Wilson and Company.
11	Polkemmet	Bathgate	Shott's Iron Company.
12	Woodend	„	Coltness Iron Company.

EASTERN DIVISION OF STIRLINGSHIRE.

1	Arnloss	Slamannan	James Watt.
2	Balquhatstone and Binniehill	„	John Watson.
3	Bantaskine	Falkirk	John Wilson.
4	Bentend	„	Carron Company.
5	Blackbraes	Muiravonside	James Russel and Son.
6	Callendar	Falkirk	Callendar Coal Company.
7	Carron Hall	„	Carron Company.
8	Drumclair	Slamannan	Nimmo and McKillop.
9	Dumbrodier	Falkirk	John M. Buchanan.
10	Grangemouth	„	Grangemouth Coal Company.
11	Jawcraig	Slamannan	William Scott and Son.
12	„	„	Matthew Hay and Son.
13	Limerigg	„	John Nimmo
14	„ and West Drumclair	„	Robert Baird.
15	Nappyfaulds	Falkirk	G. B. Watson.
16	Redding	„	Redding Colliery Company.
17	Shieldhall	„	Carron Company.
18	Standrigg	„	John Wilson.

PEEBLESSHIRE.

1	Magbiehill	Peebles	Captain Beresford.

PERTHSHIRE.

1	Comrie	Dumblane	Merry and Cunninghame.
2	Inzievar	„	Shott's Iron Company.
3	Valleyfield	„	Carron Iron Company.

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IRELAND.

No.	Colliery.	Post Town.	Proprietor.	—
	ULSTER COAL FIELD.			
	County of Antrim.			
1	Ballycastle	Ballycastle	Messrs. Merry and Cunninghame	Working.
2	„	„	J. M'Gildowny, Esq.	Working.
3	Murlough Bay	„	John M'Donnell, Esq., M.D.	Not working.
	County of Tyrone.			
1	Annahone	Stewartstown	—	Not working.
2	Coal Island	Dungannon	Mr. J. Sloan	Working.
3	„	„	Castlestewart Mining Company	—
4	Drumglass	„	Samuel Hughes, Esq.	Not working.
5	Derraghadown	„	Messrs. Dixon, Brown, and Company	Working.
	County of Cavan.			
1	Kill*	Kilnaleck	Messrs. Moore and Company	Not working.
	CONNAUGHT COAL FIELD.			
	LOUGH ALLEN DISTRICT.			
	Counties of Leitrim, Sligo, and Roscommon.			
1	Tullynaha	Drumkeeran	Patrick Buchan, Esq.	Working.
2	Tullymurry	„	„ „	„
3	Seltanaskeagh	„	„ „	„
4	Meenashammer	„	William Cronyn, Esq.	„
5	Gobarudda	Boyle	E. M'Dermott, Esq.	„
6	Geevagh	Drumkeeran	Different colliers on their own account	„
7	Greaghnageeragh	„	„ „ „	„
	LEINSTER COAL FIELD.			
	CASTLECOMER DISTRICT.			
	County of Kilkenny.			
1	Curragh	Castlecomer	Hon. Mr. Wandesforde	Not working.
2	Massford	„	„ „	„
3	Coolbawn	„	„ „	Partially, old pillars.
4	Rock	„	„ „	Working.
5	Monteen	„	„ „	„
6	Jarrow	„	„ „	„
7	Upper Riesk	„	Mr. Patrick Fenlon	Not working.
8	Broom Park	„	„ „	„
9	Crutt	„	Hon. Mr. Wandesforde	Partially, same as 3.
10	Monala	„	„ „	Not working.
11	Skehana	„	„ „	Working.
12	Firoda	„	— Freke, Esq.	Not working.
13	Baurnafea	Kilkenny	Lord Ormond	—
14	Coolcullen	„	Mr. Phillips	—
	Carlow and Queen's Counties.			
1	Bilboa	Carlow	Horace Rochfort, Esq.	Working partially.
2	Agharue	„	Sir T. Butler	Not working.
3	Ridge	„	Mr. Phillips	—
	Queen's County.			
1	Wolfhill	Ballylinan, Athy	Coal Mining Company	Working.
2	Aughamafa	„	„ „	Not working.
3	Mullaghmore	„	„ „	„
4	Kingscote	Stradbally	Rev. Sir Hunt J. Walsh, Bart.	„
5	Modubea	Ballickmoyler, Carlow	Coal Mining Company and others	Sinking shaft.
6	Rushes	Stradbally	Rev. Sir Hunt J. Walsh, Bart.	Not working.
7	Holly Park	Crettyard, Carlow	Benjamin B. Edge, Esq.	Working.
8	Meeragh	„	„ „	Not working.
9	Geneva	„	„ „	„
10	Glen	„	„ „	„
11	Towlerton	Ballickmoyler, Carlow	William Edge, Esq.	Working very partially on crop.
12	Kilgory	Crettyard, Carlow	Benjamin B. Edge, Esq.	Not working, but proving.
13	Ardataggle	Carlow	James Fitzmaurice, Esq.	Not working.
14	Coorlaghan	„	„ „	„
	MUNSTER COAL FIELD.			
	SLIEVARDAGH DISTRICT.			
	County of Tipperary.			
1	Coalbrook—*Linamrock*	New Birmingham	Mining Company of Ireland	Working.
2	Boulea—*Reform*	„	Secretary, William Herold	„
3	Earlshill	„	„ „	„

* This locality is remarkable, inasmuch as the coal (a sort of anthracite) lies in the rocks of the Lower Silurian Period.

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No.	Colliery.	Post Town.	Proprietor.	——
4	Ballynahineen	New Birmingham	Secretary, William Harold	Working.
5	Foilacamin	,,	,, ,,	,,
6	Coolquill	,,	,, ,,	Not working.
7	Glengoole	,,	,, ,,	Working.
8	Killenaisle	,,	,, ,,	,,
9	The Commons	,,	,, ,,	Not working.
10	Ballincurry	,,	,, ,,	Working.
11	Knockinglass	,,	,, ,,	,,
12	Kilcooly	,,	,, ,,	,,
13	Williamstown	,,	,, ,,	,,
14	Lickfinn	,,	,, ,,	,,
15	Ballingarry	Ballingarry	,, ,,	,,
	DUHALLOW DISTRICT.			
	County of Cork.			
1	Dromagh	Banteer, Mallow	Nicholas Philpot Leader, Esq.	Not working.
2	Lismacon	Dromagh, Mallow	Mining Company of Ireland	Working.
3	Dromskehy	,,	,, ,,	,,
4	Drominagh	,,	,, ,,	,,
	LIMERICK DISTRICT.			
1	Tulligoline	Abbeyfeale	Lord Devon	Not working.
2	Cratloe	,,	Archdeacon Goule	,,
3	Sugarhill	Newcastle	— Mansel, Esq.	,,
4	Knockaboula	Leghill	Lord Clare and Lord Mont Eagle	,,
5	Coalhill	,,	Lord Clare	,,
6	Rockview	,,	Lord Clare and — Slevin, Esq.	,,
7	Glin	Glin	Knight of Glin	,,

Appendix, No. 28.

Detail Tables of the Shipments of Coal from the Northern Ports of NEWCASTLE, SUNDERLAND, STOCKTON, HARTLEPOOL, and NORTH SHIELDS from 1801 to 1850.

Shipments of Coal from Newcastle.

Year.	Coastwise.	To Foreign Ports.	Total.	
	Tons.	Tons.	Tons.	
1801	1,198,308	133,562	1,331,870	Increase Coastwise, 445,669 tons.
1802	1,310,393	115,600	1,425,993	Decrease Foreign, 87,829 ,, or
1803	1,338,613	117,548	1,456,161	Increase Total 357,840 ,,
1804	1,536,812	139,360	1,676,172	26·8 per cent.
1805	1,464,991	131,366	1,596,357	
1806	1,558,934	123,710	1,682,644	
1807	1,404,367	76,674	1,481,041	
1808	1,540,681	42,402	1,583,083	
1809	1,428,610	36,143	1,464,753	
1810	1,648,977	45,733	1,689,710	
Total	14,525,686	963,098	15,488,784	
1811	1,678,401	47,528	1,725,929	Increase Coastwise 336,358 tons.
1812	1,671,177	66,210	1,737,387	Do. Foreign 71,206 ,, since
1813	1,548,087	39,116	1,587,203	Do. Total 397,618 ,,
1814	1,730,250	84,763	1,805,013	1,811, or 28·05 per cent.
1815	1,723,054	112,450	1,835,504	
1816	1,797,105	116,025	1,913,125	
1817	1,650,885	137,262	1,788,151	
1818	1,783,458	126,521	1,909,979	
1819	1,695,965	105,297	1,801,262	
1820	2,004,759	118,788	2,123,547	
Total	17,873,140	953,960	18,827,100	
1821	1,834,650	127,457	1,962,107	Increase Coastwise 333,705 tons.
1822	1,736,171	148,365	1,884,536	Do. Foreign 69,851 ,, or
1823	1,968,109	121,391	2,089,500	Do. Total 402,556 ,,
1824	1,823,148	129,966	1,953,114	20·5 per cent.
1825	1,820,626	136,266	1,956,892	
1826	2,699,867	165,943	2,865,810	
1827	1,811,924	173,355	1,985,279	
1828	1,921,467	157,211	2,078,678	
1829	1,956,829	163,380	2,120,209	
1830	2,167,355	197,308	2,364,663	
Total	19,139,146	1,530,642	20,649,788	

Year.	Coastwise.	To Foreign Ports.	Total.	
	Tons.	Tons.	Tons.	
1831	2,097,617	161,247	2,258,864	Increase Coastwise 185,726 tons.
1832	1,809,412	197,337	2,006,749	Do. Foreign 433,664 ,, or
1833	1,926,205	233,709	2,159,914	Do. Total 616,390 ,,
1834	2,022,226	230,342	2,252,568	27·28 per cent.
1835	2,266,531	313,107	2,579,638	
1836	2,280,713	415,849	2,696,562	
1837	2,392,404	476,157	2,868,651	
1838	2,459,728	554,175	3,013,903	
1839	2,159,321	558,052	2,717,373	
1840	2,281,343	593,911	2,875,254	
Total	21,695,590	3,733,886	25,429,476	
1841	2,397,977	750,585	3,148,562	Decrease Coastwise 127,598 tons.
1842	2,350,480	866,281	3,216,761	Increase Foreign 857,910 ,, or
1843	2,289,531	815,434	3,104,965	Do. Total 730,312 ,,
1844	1,999,396	602,152	2,601,550	6·68 per cent.
1845	2,448,982	1,069,737	3,513,719	
1846	2,302,606	1,064,327	3,366,933	
1847	2,618,941	1,009,641	3,628,582	
1848	2,273,674	994,299	3,267,973	
1849	2,143,380	834,005	2,977,385	
1850	2,270,379	1,088,495	3,358,874	
Total	23,090,348	9,094,956	32,185,304	

Appendix No. 29.

Shipments of Coal from Sunderland.

Year.	Coastwise.	To Foreign Ports.	Total.	
	Tons.	Tons.	Tons.	
1801	612,197	12,607	624,804	Increase Coastwise 670,191 tons.
1802	808,449	82,694	891,143	Decrease Foreign 7,521 ,, or
1803	792,207	26,942	819,149	Increase Total 662,670
1804	793,812	11,029	804,841	68·84 per cent
1805	830,263	15,782	846,045	
1806	811,618	7,424	819,042	
1807	775,987	11,331	787,318	
1808	923,850	5,455	929,305	
1809	858,944	2,579	861,523	
1810	982,388	5,086	987,474	
Total	8,189,715	180,929	8,370,644	

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Year.	Coastwise.	To Foreign Ports.	TOTAL.	
	Tons.	Tons.	Tons.	
1811	876,996	4,583	881,579	Increase Coastwise 225,331 tons.
1812	897,964	8,343	906,307	Do. Foreign 83,644 " since
1813	819,947	4,715	924,662	Do. Total 238,975
1814	989,690	29,228	1,018,918	1811 or 29·38 per cent.
1815	895,443	45,021	940,464	
1816	1,027,371	42,215	1,069,586	
1817	964,25	30,811	995,061	
1818	1,058,245	41,973	1,100,218	
1819	1,002,895	40,995	1,043,890	
1820	1,102,327	38,227	1,140,554	
Total	9,734,528	286,111	10,020,639	
1821	1,050,443	38,624	1,089,067	Increase Coastwise 271,553 tons.
1822	1,051,840	43,509	1,095,349	Do. Foreign 36,577 " or
1823	1,317,285	41,198	1,358,583	Do. Total 297,935 "
1824	1,301,645	42,082	1,343,727	27·35 per cent.
1825	1,382,759	41,157	1,423,916	
1826	1,455,988	38,419	1,494,407	
1827	1,387,109	39,635	1,426,734	
1828	1,350,354	60,743	1,411,097	
1829*	1,466,559	61,500	1,498,059	
1830*	1,332,001	65,001	1,397,002	
Total	13,056,983	471,858	13,527,941	
1831*	1,106,396	150,000	1,256,396	Decrease Coastwise 226,166 tons.
1832*	1,046,652	154,500	1,201,152	Increase Foreign 236,987 " or
1833	1,176,176	176,487	1,352,663	Decrease Total 84,519 "
1834	962,087	140,956	1,103,043	4·36 per cent.
1835	929,187	154,538	1,083,725	
1836	971,458	170,367	1,141,825	
1837	932,135	242,463	1,174,598	
1838	948,429	308,168	1,256,597	
1839	913,960	370,620	1,284,580	
1840	868,226	442,987	1,311,213	
Total	9,844,706	2,320,086	12,164,794	
1841	937,995	408,515	1,346,510	Increase Coastwise 1,126,033 tons.
1842	859,231	364,886	1,224,117	Do. Foreign 63,564 " or
1843	877,451	305,991	1,183,442	Do. Total 1,190,636 "
1844	826,702	220,434	1,047,136	88·45 per cent.
1845	1,536,654	428,400	1,965,054	
1846	1,582,218	478,505	2,060,723	
1847	1,871,171	476,446	2,347,617	
1848	1,911,812	498,158	2,409,970	
1849	1,771,215	447,280	2,218,495	
1850	2,066,027	471,109	2,537,136	
Total	13,240,476	4,099,724	18,340,200	

APPENDIX No. 30.

The first SHIPMENT of COAL from STOCKTON occurred in 1822. In the earlier years there are some gaps which cannot now be supplied.

Year.	Coastwise.	To Foreign Ports.	TOTAL.
	Tons.	Tons.	Tons.
1822	1,224	..	1,224
1823	..	..	..
1824	..	..	..
1825	..	..	..
1826	10,754	..	10,754
1827	33,183	..	33,183
1828	66,051	..	66,051
1829	..	..	..
1830	..	..	..
Total	110,211	..	110,211

* The total export only was given in those years; the divisions, coastwise and foreign, are therefore only estimates.

Year.	Coastwise.	To Foreign Ports.	TOTAL.	
	Tons.	Tons.	Tons.	
1831	..	..	..	Increase Coastwise 788,788 tons in 8 years.
1832	..	..	..	Do. Foreign 129,148 " "
1833	578,800	3,700	582,500	Do. Total 917,874 " "
1834	633,464	9,988	633,472	Do. per cent. 137·57
1835	677,941	26,840	704,781	
1836	916,440	36,942	953,382	
1837	1,145,837	46,516	1,192,353	
1838	1,219,938	86,699	1,306,637	
1839	1,308,778	111,707	1,420,485	
1840	1,367,532	133,842	1,500,374	
Total	7,858,750	455,234	8,293,984	
1841	1,483,613	169,345	1,652,963	Decrease Coastwise 67,880 tons.
1842	1,501,896	180,808	1,682,464	Increase Foreign 67,631 " "
1843	1,446,069	224,593	1,670,662	Total Decrease 189 " "
1844	1,415,688	237,166	1,652,804	Decrease per cent. 000·9
Total of 4 yrs.	5,846,921	811,912	6,658,833	
1845	816,380	128,626	944,965	Decrease Coastwise 331,624 tons.
1846	662,279	148,110	810,389	Do. Foreign 46,906 "
1847	727,812	134,073	861,885	Total Decrease 378,529 "
1848	556,950	105,094	662,044	Decrease per cent. 40·0 "
1849	402,225	112,897	515,122	
1850	494,735	81,721	566,456	
Total	9,497,281	1,523,483	11,019,714	
Total of 6 yrs.	3,650,360	710,571	4,360,931	

APPENDIX No. 31.

SHIPMENTS of COAL from HARTLEPOOL.

Year.	Coastwise.	To Foreign Ports.	TOTAL.	
	Tons.	Tons.	Tons.	
1845	726,183	158,225	884,408	Increase Coastwise 506,317 tons.
1846	601,431	186,487	787,918	Do. Foreign 171,675 " "
1847	703,113	186,478	889,591	Total Increase 677,992 " "
1848	922,566	245,060	1,165,626	Increase per cent. 76·6
1849	1,037,300	253,704	1,291,004	
1850	1,333,500	229,900	1,563,400	
Total	5,323,225	1,257,804	6,581,039	

SHIPMENTS of COAL from NORTH SHIELDS.

Year.	Coastwise.	To Foreign Ports.	TOTAL.	
	Tons.	Tons.	Tons.	
1848	214,709	117,162	331,871	Increase Coastwise 271,40 tons.
1849	255,846	214,666	470,512	Do. Foreign 87,736 " "
1850	241,869	204,809	446,759	Total Increase 114,888 " "
Total	712,426	536,717	1,249,142	Increase per cent. 84·6

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APPENDIX, No. 32.

TOTAL AGGREGATE SHIPMENTS from the NORTHERN PORTS from 1801 to 1850, exhibiting total Increase.

—	NEWCASTLE.	SUNDERLAND.	STOCKTON.	HARTLEPOOL.	NORTH SHIELDS.	Total from Northern Ports.	Total Increase on previous 10 years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
From 1801 to 1810, both inclusive	15,488,784	8,370,644	—	—	—	23,859,428	—
From 1811 to 1820, both inclusive	18,227,100	10,020,639	—	—	—	28,247,739	4,388,311
From 1821 to 1830, both inclusive	28,649,788	13,527,941	110,211	—	—	34,287,940	6,040,201
From 1831 to 1840, both inclusive	25,429,476	12,164,794	8,293,984	—	—	45,888,254	11,600,314
From 1841 to 1850, both inclusive	32,185,304	18,340,200	17,019,714	6,581,039	1,249,143	69,375,400	23,487,146

APPENDIX No. 33.

COAL and COKE TONNAGE on the GREAT NORTH of ENGLAND RAILWAY for twelve months, being the number of tons delivered at each of the under-mentioned coal depôts in each month for one year, ending November 30th, 1844.*

—	Darlington Bank Top.	Black Banks.	Croft.	Cowton.	North Allerton.	Otterington.	Thirsk.	Sessay.	Baskelf.	Alne.	Tollerton.	Shipton.	York.	Total in each Month.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
December, 1843 -	3½	—	335½	347½	1,680½	139	1,430½	476	380½	484½	199½	87½	4,103½	9,666½
January, 1844 -	11½	16½	418½	203½	1,885½	130½	1,161	392	366½	383½	214	168	4,991	10,291½
February - -	—	3½	652½	356½	1,953½	155½	1,160½	315½	354½	231½	225½	64	6,805½	12,278
March - -	15½	—	744½	453½	2,075½	105½	1,099	350½	460	408	286½	122	7,782½	13,903½
April - - -	2½	22½	230½	24	745½	38½	480	170½	202½	93½	156	20½	2,904	5,092½
May - - -	—	102	448½	113	1,225½	62½	706½	282	216	236	187½	55	1,553½	5,269½
June - - -	5½	6½	789½	384	2,334½	84½	1,177½	310½	441½	272½	216	77	2,874½	8,978
July - - -		30½	750½	256	1,179½	88½	784	321½	254	223½	104½	104½	4,631½	8,721½
August - - -	—	28½	655½	327½	1,670½	73½	906½	276½	356½	223½	169½	117½	6,224½	11,630½
September - -	7½	38½	663½	371½	1,634½	96½	832	220½	279½	218½	122½	122½	7,474½	12,064½
October - - -	10½	—	546½	428½	2,173½	147	1,345	366½	424½	304½	229	121½	9,794½	15,892½
November - -	6	—	523½	521½	2,220	104½	1,158½	467½	530½	335½	272½	157½	1,470½	17,746½
Totals - -	65½	238½	6,758½	3,786½	20,808½	1,236½	12,221½	3,950	4,266½	3,364½	2,333½	1,199½	60,710	130,980½

* Statistics and Calculations, by Samuel Salt, 1845.

APPENDIX No. 34.

QUANTITIES of COAL exported from Ports of GREAT BRITAIN North of the HUMBER, from 1800 to 1816*; with the Total Shipments converted into Statute Tons.

Years.	Coastwise.		Foreign, including Ireland.		Total Shipments.		Total Exports.	
	Tons.	Winchester Chaldrons.	Tons.	Winchester Chaldrons.	Tons.	Winchester Chaldrons.	Tons.	
1801 -	129,090	1,404,756	20,194	136,203	149,284	1,540,959	2,115,506	
1802 -	129,455	1,622,643	15,778	178,687	145,233	1,801,530	2,442,153	
1803 -	129,188	1,637,970	18,220	151,064	147,408	1,789,034	2,428,416	
1804 -	135,286	1,774,498	21,000	149,792	156,286	1,924,290	2,607,255	
1805 -	134,846	1,749,539	25,340	153,940	160,186	1,903,479	2,587,121	Increase in 10 years, 777,674 tons, or 36·79 per cent.
1806 -	147,943	1,808,249	31,557	156,082	179,500	1,964,331	2,681,522	
1807 -	151,677	1,651,441	31,017	122,813	182,694	1,774,254	2,444,867	
1808 -	150,102	1,950,016	29,447	93,003	179,549	2,043,019	2,784,448	
1809 -	146,339	1,755,518	24,980	74,715	171,319	1,830,233	2,504,816	
1810 -	146,511	2,016,776	39,734	104,734	186,245	2,121,510	2,891,170	
1811 -	136,497	1,953,037	31,384	112,826	167,881	2,065,863	2,801,856	Increase in 6 years, 386,207 tons, or 13·77 per cent.
1812 -	142,413	1,967,198	51,255	147,881	193,668	2,115,079	2,890,393	
1813 -	148,505	1,876,995	33,381	100,480	181,886	1,977,475	2,692,616	
1814 -	146,996	2,063,943	33,347	166,762	180,343	2,230,705	3,024,491	
1815 -	147,369	1,981,946	45,267	200,994	192,636	2,182,940	2,930,884	
1816 -	138,651	2,148,301	44,395	207,788	183,046	2,356,090	3,187,063	

* Accounts and Papers, House of Commons Library, Vol. XIV., 1817, p. 233.

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The following return repeats a portion of the above, but it gives some additional information of much value :—

RETURN to an Order of the Honourable House of Commons, dated 24th February 1817, requiring—

AN ACCOUNT showing the Number of Chaldrons of Coals exported from any Ports of Great Britain North of the Humber, since the year 1794 ; specifying the Total Quantity in each year, and distinguishing the Quantity shipped for the Port of London, for the out Ports, and for Foreign Countries respectively, so far as the same can be made out.

Years.	NUMBER of CHALDRONS of COALS exported from Ports in Great Britain, North of the Humber.									
	To London.		To other Ports of Great Britain.		Total Quantity shipped Coastways.		To Foreign Countries including Ireland.		TOTAL.	
	Tons.	Chaldrons (Winchester measure).	Tons.	Chaldrons (Winchester measure).	Tons.	Chaldrons (Winchester measure).	Tons.	Chaldrons (Winchester measure).	Tons.	Chaldrons (Winchester measure).
1795	The distinction of London from other ports of Great Britain for these years cannot be made without very considerable delay, in consequence of the partial destruction of the records thereof by Fire				135,687	1,495,954½	17,147	117,635½	152,834	1,613,590½
1796					122,551	1,418,850	25,368	126,269	147,919	1,545,119
1797					133,539	1,486,310	19,868	111,605½	153,407	1,597,915½
1798					149,845	1,355,257	25,666	127,703	175,511	1,482,960
1799	—	885,365	125,900	631,939	125,900	1,517,304	12,671	124,918½	138,571	1,642,222½
1800	—	1,018,041½	134,101	684,237	134,101	1,702,331	19,866	138,407	153,434	1,840,738
1801	—	836,917	129,090	567,839	129,090	1,404,756	20,194	136,203½	149,284	1,540,959½
1802	—	932,353	129,455	699,420	129,455	1,632,843	15,778	178,687	145,233	1,801,530
1803	—	1,040,349½	129,188	597,620½	129,188	1,637,970	18,220	151,064	147,408	1,789,034
1804	—	983,492½	135,286	791,005½	135,286	1,774,498	21,000	149,792	156,286	1,924,290
1805	—	966,462½	134,846	783,076½	134,846	1,749,539	25,340	153,940	160,186	1,903,479
1806	—	988,093	147,943	820,156	147,943	1,808,249	31,557	156,083	179,500	1,964,331
1807	—	914,321½	151,077	737,119½	151,077	1,651,441	31,017	122,813	182,094	1,774,254
1808	—	1,094,640½	150,102	855,375½	150,102	1,950,016	29,447	93,003	179,549	2,043,019
1809	—	975,939½	146,359	779,578½	146,359	1,755,518	24,980	74,715	171,319	1,830,233
1810	—	1,102,747½	146,511	914,028½	146,511	2,016,776	39,734	104,734½	186,245	2,121,510½
1811	—	1,096,873	136,497	856,104	136,497	1,953,037	31,384	112,826	167,881	2,065,863
1812	—	1,066,287½	142,413	900,910½	142,413	1,967,198	51,255	147,881½	193,668	2,115,079½
1813	—	1,020,187½	148,505	856,807½	148,505	1,876,995	33,381	100,480	181,886	1,977,475
1814	—	1,119,788	146,996	944,155	146,996	2,063,943	33,347	166,762	180,343	2,230,705
1815	—	1,144,363½	147,369	887,582½	147,369	1,981,946	45,267	200,904	192,636	2,182,940
1816	—	1,217,493½	138,651	930,868½	138,651	2,148,361½	44,395	207,788½	183,046	2,356,090

Custom House, London, 20th May 1817.

WILLIAM IRVING,
Inspector-General of the Imports and Exports of Great Britain.

APPENDIX No. 35.

No. 1.

PIG IRON made in GREAT BRITAIN, and Number of Furnaces, in 1823 and 1830.

A Comparative Statement made for Government by Mr. F. Finch, 1831–2.

NORTHUMBERLAND AND DURHAM.

Furnaces.	1823.		1830.	
	Total No. of Furnaces.	Pig Iron made.	Total No. of Furnaces.	Pig Iron made.
		Tons.		Tons.
Birtley	—	—	2	3,080
Lemmington	2	2,379	2	2,247
Total	2	2,379	4	5,327

Increase :—2 furnaces ; 2,948 tons, or 123 per cent.

YORKSHIRE.

—	Furnaces.	1823.		1830.	
		Total No. of Furnaces.	Pig Iron made.	Total No. of Furnaces.	Pig Iron made.
			Tons.		Tons.
1	Bowling	3	5,366	3	5,117
2	Brierley	1	2,450	2	4,590
3	Chapel Town	1	1,400	1	1,631
4	Elsecar	3	1,400	3	1,460
5	Holmes	3	2,000	3	1,000
6	Low Moor	4	6,200	4	—
7	Shelf	3	—	3	7,480
8	Milton	2	2,187	2	1,715
9	Sheffield Park	2	2,018	2	2,081
10	Thorncliffe	3	2,909	3	2,188
11	Worsborough	1	1,381	1	1,664*
	Total	26	27,311	27	28,926

Increase :—1 furnace ; 1,615 tons, or 5 per cent.

* "This quantity is estimated." The internal evidence in these published returns appear to show that other returns than those of Worsborough have been estimated ; or the returns have been very loosely given, notwithstanding they were collected at the request of Government.

No. 2.

DERBYSHIRE.

—	Furnaces.	1823.		1830.	
		Total No. of Furnaces.	Pig Iron made.	Total No. of Furnaces.	Pig Iron made.
			Tons.		Tons.
1	Alfreton	2	2,690	2	2,950
2	Brampton	2	1,807	2	1,245
3	Butterley	3	2,639	3	3,981
4	Calow	1	—	1	123
5	Codnor Park	2	2,096	3*	2,455
6	Duckmanton	1	1,091	1	1,446
7	Grassmore	—	—	—	—
8	Morley Park	1	544	2*	1,428
9	Renishaw	2	2,120	2	2,810
10	Staveley	1	1,051	2*	1,561
	Total	15	14,038	18	17,999

Increase :—3 furnaces ; 3,961 tons, or 28 per cent.
* Erected in 1825, Morley Park - 1
" " Staveley - 1
" 1828, Codnor Park - 1

No. 3.

SHROPSHIRE.

—	Furnaces.	1823.		1830.	
		Total No. of Furnaces.	Pig Iron made.	Total No. of Furnaces.	Pig Iron made.
			Tons.		Tons.
1	Broseley	2	—	2	270
2	Barnett Leasow	2	2,755	2	1,316
3	Benthall	1	—	1	—
4	Calcutts	2	1,833	2	—
5	Coalbrooke Dale	2	—	2	—
6	Dawley Castle	2	4,925	2	4,312
7	Donnington	*3	8,074	5	15,110
8	Horsehay	3	4,854	3	6,883
9	Hadley	2	2,080	2	—
10	Kitley	3	4,984	3	5,763
11	Lightmoor	3	6,052	3	6,194
12	Madeley Wood	3	2,475	3	3,471
13	Old Park	4	6,900	4	15,300
14	Snedshill	2	2,786	2	317
15	Wombridge	2	5,084	3	7,134
16	Wrockwardine	*2	5,121	2	—
17	Stirchley	—	—	4†	—
18	Lawley	—	—	1	3,073
19	Langley	—	—	2	4,325
	Total	38	57,923	48	73,418

Increase :—10 furnaces ; 15,425, or 26 per cent.
* Two furnaces were built at Donnington in 1828, in the place of the two at Wrockwardine which were blown out.
† The quantity made in 1830 is included in the Old Park return.

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No. 4.
STAFFORDSHIRE.

—	Furnaces.	1823. Total No. of Furnaces.	1823. Pig Iron made.	1830. Total No. of Furnaces.	1830. Pig Iron made.
			Tons.		Tons.
1	Bradley	2	4,195	2	4,194
2	Do. Lower	1	1,920	1	2,113
3	Birch Hills	2	..	2	..
4	Barber's Field	..	..	2	5,720
5	Bilston	4	7,696	4	4,680
6	Do. Brook	2	4,345	2	3,771
7	Broadwaters	2	..	..	6,368
8	Brettell Lane	..	..	2	2,949
9	Brierley Hill	2	4,348	2	..
10	Blower's Green	2	5,348	2	5,257
11	Buffery	3	6,551	3	5,246
12	Do. Old	1	2,646	1	2,158
13	Cotham	..	..	..	..
14	Coseley	2	5,200	3	10,140
15	Caponfield	2	..	2	..
16	Chilliington	..	..	2	6,240
17	Corbyn's Hall	..	..	4	7,350
18	Dudley Port	1	2,340	1	2,340
19	Do.	..	..	2	4,060
20	Depfield	2	..	2	..
21	Deepdale	1	2,084	1	1,634
22	Dudley Wood	4	10,467	4	8,664
23	Eagle	2	4,900	2	6,656
24	Fiery Holes	1	..	1	1,634
25	Glebe	1	..	1	..
26	Gospel Oak	2	5,312	4	6,840
27	Gold's Green	2	4,888	3	9,412
28	Graveyard	1	..	1	..
29	Gorwale Wood	1	1,671	1	..
30	Horseley	2	4,308	2	4,680
31	Hale Fields	1	2,454	1	2,454
32	High Fields	2	..	2	..
33	Lea Brook	1	..	1	..
34	Leys	..	..	2	4,160
35	Level	4	6,464	4	..
36	Do. Old	1	2,072	1	1,028
37	Mill Fields	4	6,768	4	8,112
38	Moorcroft	2	3,700	2	4,791
39	Netherton	2	1,408	2	5,033
40	Oldbury	2	2,600	2	5,720
41	Old Park	1	2,600	2	5,280
42	Priestfield	3	3,664	3	4,897
43	Parkfield	..	..	4	9,500
44	Parkhead	1	2,289	1	2,468
45	Rough Hills	2	..	2	..
46	Russell's Hall	..	..	2	2,080
47	Stow Heath	..	..	3	5,408
48	Toll End	3	5,075	3	6,112
49	Tipton Company	3	5,640	3	3,515
50	Tipton	1	2,040	1	2,040
51	Union	..	..	2	4,650
52	Wednesbury Oak	2	6,240	3	7,684
53	Willingsworth	..	..	3	5,704
54	Wolverhampton	..	..	2	3,200
55	Walbrook	1	2,359	2	2,886
56	Windmill End	..	..	2	3,776
	Total	81	133,590	118	211,604

Increase:—39 furnaces; 79,014 tons, or 58 per cent.

Barber's Field built in 1826 and 1828.
Brettel Lane „ 1825.
Chillington „ 1829.
Corbyn's Hall „ 1825 and 1829.
Dudley Port „ 1824.
Levels „ 1828.
Parkfield „ 1825–26–27.
Russell's Hall „ 1827.
Stow Heath „ 1824–25.
Union „ 1828.
Willingsworth „ 1827–28.
Wolverhampton „ 1824–26.
Windmill End „ 1825.

No. 5.
SOUTH WALES.

—	Furnaces.	1823. Total No. of Furnaces.	1823. Pig Iron made.	1830. Total No. of Furnaces.	1830. Pig Iron made.
			Tons.		Tons.
1	Abersychan	..	..	6	10,640
2	Aberdare	3	5,676	6	12,571
3	Abernant	3			
4	Blaenavon	5	16,882	5	13,843
5	Beaufort	3	5,243	4	7,276
6	Blaina	..	..	3	4,905
7	Coalbrooke Vale	1	2,704	2	2,780
8	Cefn Cribber	..	..	1	..
9	Cyfarthfa	8	24,200	9	29,000
10	Clydach	2	5,200	9	10,190
11	Dowlais	8	22,287	12	32,611
12	Gadlys	..	..	1	..
13	Hirwain	2	4,160	4	9,360
14	Maesteg	..	..	1	2,430
15	Nant-y-glo	5	17,750	7	23,883
16	Pent-wyn	..	..	3	5,891
17	Pont rhydy Ven	..	..	2	..
18	Pentyrct	1	1,235	1	2,412
19	Plymouth	3	6,387	5	18,582
20	Penydarran	5	15,547	5	17,015
21	Romney and Bute	3	5,500	6	7,608
22	Race	3	3,173	3	2,421
23	Ryddry	..	..	1	220
24	Sirhowey and Ebbw Vale	6	20,425	6	26,020
25	Tredegar	5	16,385	5	18,514
26	Varteg Hill	2	6,513	5	13,536
27	Vigurs & Smith's Cwm Avon	1	1,560	1	1,950
28	Yniscedwyn	1	1,498	2	2,111
29	Neath Abbey	2	..	2	2,374
30	Pembray	..	..	2	..
	Total	72	182,925	119	277,643

Increase:—41 furnaces; 95,318 tons, or 28 per cent.

No. 6.
SCOTLAND.

—	Furnaces.	1823. Total No. of Furnaces.	1823. Pig Iron made.	1830. Total No. of Furnaces.	1830. Pig Iron made.
			Tons.		Tons.
1	Clyde	3	2,500	4	8,000
2	Calder	3	4,000	4	9,000
3	Monkland	..	..	2	2,000
4	Muirkirk	3	3,500	3	4,000
5	Gartsherrie	..	..	1	..
6	Shotts	1	2,000	1	2,000
7	Carron	5	7,000	5	7,000
8	Devon	3	3,000	3	3,500
9	Wilsontown	2	..	2	2,000
10	Omea	2	2,500	2	..
	Total	22	24,500	27	37,500

The History of the Iron Trade from the earliest records to the present time. By Harry Scrivenor. 1854.

It is evident that the above for Scotland, must be taken as an estimate merely; but probably it is not far from correct.

The above tables were prepared, at the request of the Government, by Mr. F. Finch, who took a considerable amount of care to produce a correct return. Scotland was not included in Mr. Finch's return; the table given was supplied for the year by Mr. Scudamore.

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APPENDIX No. 36.

COALS IMPORTED into the PORT of LONDON.

Ports from which Shipped.	1828 to 1831.	1832 to 1835.	Decrease.	Increase.
	Tons.	Tons.	Tons.	Tons.
Newcastle	5,178,255	4,641,724	536,531	..
Sunderland	2,241,207	2,455,663	..	214,456
Stockton	110,413	795,765	..	685,352
Blyth and Seaton Sluice	257,568	226,941	30,627	..
Inverkeithing and other Scotch Ports	89,321	145,159	..	55,838
Swansea, Llanelly, and other Welsh Ports	126,799	148,988	..	22,198
Hull, Goole, and other Ports in Yorkshire.	100,538	112,744	..	12,206
TOTAL	8,104,101	8,526,984	567,158	990,041

COALS BROUGHT into the PORT of LONDON COASTWISE and by INLAND NAVIGATION in the Years 1833 to 1834.

	Coals, 1833.	Coals, 1834.
	Tons.	Tons.
From the Port of Newcastle	1,060,839	1,142,903
From the Port of Sunderland	666,787	559,105
From the Port of Stockton	170,690	221,971
From Blythe and Seaton Sluice	48,689	64,268
From Ports in Scotland	15,138	39,497
From Ports in South Wales	32,156	33,200
From Yorkshire Ports	16,110	17,751
Quantity which passed the Boundary on the Grand Junction Canal at Grove Park, Herts, and on the River Thames at Staines	4,395½	1,862
TOTAL	2,014,804½	2,080,547

Commons Paper, 51, March 18, 1835. Accounts and Papers, Vol. xlviii. 1835, p. 31.

APPENDIX No. 37.

COALS IMPORTED into the PORT of LONDON from the following ports:

NEWCASTLE.

	Tons.
1836	1,235,406
1837	1,279,890

SUNDERLAND.

1836	743,849
1837	834,862

STOCKTON.

1836	268,222
1837	370,530

BLYTH and SEATON SLUICE.

1836	71,775
1837	71,856

INVERKEITHING and other PORTS in SCOTLAND.

	Tons.
1836	22,674
1837	18,735

SWANSEA, LLANELLY, and other WELSH PORTS.

1836	35,237
1837	35,018

HULL, GOOLE, and other YORKSHIRE PORTS.

1836	21,189
1837	16,106

ACTS of PARLIAMENT relating to coal brought by railways to London since 1833.

3 & 4 Will. 4. c. 36., 1833.

Duty payable on all coal brought by the Birmingham Railway nearer to London than a stone to be placed at the entrance of the intended tunnel at Cashir in the parish of Watford, Herts.

4 & 5 Will. 4. c. 38., 1834.

Duty payable on all coal brought by the Southampton Railway nearer to London than a stone to be placed at the junction of the Basingstoke canal and river Wey navigations, Chertsey, Surrey.

5 & Will. 4. c. 107., 1835.

Duty payable on all coal brought by the Great Western Railway nearer to London than a stone to be placed on the east bank of the river Colne in the parish of Hillingdon.

6 & 7 Will. 4. c. 75., 1836.

Duty payable on all coal brought by the London and Dover (South-eastern) Railway nearer to London than a stone to be placed in the parish of Lympsfield, Surrey.

6 & 7 Will. 4. c. 103.

Duty payable on all coal brought by the London and Cambridge (Northern and Eastern Counties) Railway nearer to London than a stone to be placed in the parish of Hoddesdon, Herts.

6 & 7 Will. 4. c. 106.

Duty payable on all coal brought by the London and Norwich (Eastern Counties) Railway nearer to London than a stone to be placed at the junction of the parishes of Shenfield and Mount Nessing, Essex.

6 & 7 Will. 4. c. 108, 1836.

Duty payable on all coal brought by the Thames Haven Railway nearer to London than a stone to be placed where the railway crosses the road from Orsett to Horndon-on-the-Hill in the parish of Horndon-on-the-Hill, Essex.

1 Vict. c. 119., 1837.

Duty payable on all coal brought by the Brighton Railway nearer to London than the junction of the parishes of Gatton and Merstham, Surrey.

EXTRACT from REPORT from SELECT COMMITTEE on the COAL TRADE (Port of London) BILL, June 13th, 1838, page 158.

(*Question* 3032.) Then it appears that care has been taken that this duty, which at first was given you by charter, to be levied upon coals coming by the river, has now been extended to all coals coming by other public means of conveyance within a circumference of about 15 miles around the metropolis, and in some places rather more?—Yes.

With respect to canals, that began in 1793, and with respect to railroads, 1833?—Yes.

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Appendix No. 38.

Return of the Number of Ships with their Tonnage, distinguishing British from Foreign, that have cleared outwards in each year from 1830 to 1841, inclusive, from the ports of the Tyne, including Blyth and Hartley, the Wear and the Tees, together with Seaham Harbour and Hartlepool, and the ports of the Humber, with cargoes, or part cargoes, of coal, for the purpose of exportation to foreign countries.*

Ports of the Tyne.

Years.	British.		Foreign.	
	Ships.	Tons.	Ships.	Tons.
1830	728	88,730	560	44,833
1831	630	76,991	532	61,222
1832	773	126,598	445	48,957
1833	792	134,866	624	61,256
1834	816	135,657	599	60,634
1835	1,014	179,968	796	82,355
1836	1,391	196,951	876	96,758
1837	1,521	237,444	1,085	122,440
1838	1,525	251,959	1,177	127,486
1839	1,697	282,154	1,266	139,171
1840	1,984	318,414	1,319	136,489
1841	2,346	389,427	1,455	168,099

Ports of the Tees, &c.

Years.	British.		Foreign.	
	Ships.	Tons.	Ships.	Tons.
1830	3	262	4	318
1831	9	1,019	2	144
1832	6	754	2	221
1833	15	2,340	9	1,039
1834	51	7,339	15	1,080
1835	123	18,899	39	3,040
1836	113	18,990	197	12,522
1837	124	20,077	274	66,555
1838	216	33,160	410	26,615
1839	301	52,307	824	32,791
1840	364	65,181	544	35,763
1841	454	80,139	596	44,892

Ports of the Wear, &c.

Years.	British.		Foreign.	
	Ships.	Tons.	Ships.	Tons.
1830	599	107,244	114	9,889
1831	652	108,912	225	20,547
1832	691	127,951	223	20,783
1833	655	122,708	269	26,981
1834	512	94,798	310	28,186
1835	459	83,878	401	37,314
1836	535	100,691	359	30,465
1837	693	132,261	576	45,077
1838	844	158,559	809	63,747
1839	1,074	202,902	762	60,535
1840	1,319	252,853	815	65,653
1841	1,231	233,009	791	62,999

* Statistics and Calculations, by Samuel Salt, 1845.

Ports of the Humber, &c.

Years.	British.		Foreign.	
	Ships.	Tons.	Ships.	Tons.
1830	There are no records to distinguish the ships that carried coal from other branches of trade in these years.			
1831				
1832				
1833				
1834	118	20,444	55	5,268
1835	85	14,912	65	6,400
1836	89	20,015	72	8,364
1837	73	14,709	67	4,642
1838	121	22,343	96	7,177
1839	110	22,206	321	22,959
1840	125	25,762	222	17,376
1841	169	31,770	204	21,853

The quantity of coals shipped at Workington for ten months, ending March 31st, 1845.

Earl of Lonsdale, Clifton Colliery	-	6,230
Jos. Harris & Co., Greysouthern	Collieries	2,194
J. W. Fletcher & Co.	ditto ditto	2,448
W. Thornburn & Co., Cawerton	ditto	9,405

Appendix, No. 39.

Coals Imported into the Port of London in each of the following Years, ending 5th January.

Years.	Coastwise.	Total.
	Chaldrons.	Chaldrons.
1801	1,011,119	1,011,119
1802	832,889	832,889
1803	927,831	927,831
1804	916,277	916,277
1805	975,840	975,840
1806	964,157	966,220
1807	985,609	990,417
1808	910,953	915,140
1809	1,091,767	1,096,816
1810	973,843	980,372
1811	1,099,371	1,105,462
1812	1,094,511	1,098,128
1813	1,065,013	1,067,892
1814	1,019,166	1,021,873
1815	1,118,352	1,121,876
1816	1,142,547	1,145,443
1817	1,217,923	1,219,643
1818	1,150,622	1,151,978
1819	1,203,832	1,204,057
1820	1,170,293	1,171,178
1821	1,320,000	1,321,860
1822	1,291,994	1,293,081
1823	1,234,883	1,235,612
1824	1,433,865	1,435,195
1825	1,466,941	1,468,242
1826	1,422,555	1,423,593
1827	1,557,623	1,558,810

Accounts and Papers, vol. xviii., 1826–27, p. 13.

Appendix, No. 40.

A Comparative Statement of Coals imported into the Port of London in each Year from 1828 to 1835 inclusive from each of the following Ports:—

NEWCASTLE.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	3,956	1,259,429	
1829	4,166	1,299,497	5,178,255
1830	4,268	1,367,478	
1831	3,845	1,251,851	
1832	3,627	1,171,227	
1833	3,387	1,060,839	4,641,724
1834	3,625	1,142,903	
1835	3,900	1,266,765	

Decrease in the last four years, 536,531 tons.

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SUNDERLAND.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	1,963	523,231	
1829	2,270	604,386	2,241,207
1830	2,065	552,356	
1831	2,041	561,234	
1832	2,145	600,217	
1833	2,369	666,787	2,455,663
1834	2,063	559,105	
1835	2,182	629,554	

Increase in the last four years, 214,456 tons.

STOCKTON.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	100	19,448	
1829	48	3,902	110,413
1830	162	24,314	
1831	337	62,749	
1832	783	172,930	
1833	773	170,690	795,756
1834	1,007	221,971	
1835	966	230,174	

Increase in the last four years, 685,352 tons.

BLYTH AND SEATON SLUICE.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	293	79,576	
1829	213	60,927	257,563
1830	210	57,204	
1831	223	59,861	
1832	190	48,938	
1833	178	48,689	226,941
1834	248	64,268	
1835	251	65,046	

Decrease in the last four years, 30,627 tons.

INVERKEITING and OTHER PORTS in SCOTLAND.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	97	21,745	
1829	46	9,125	89,321
1830	79	19,114	
1831	167	39,337	
1832	199	49,579	
1833	67	15,138	145,159
1834	176	39,487	
1835	249	40,955	

Increase in the last four years, 55,838 tons.

SWANSEA, LLANELLY, and OTHER PORTS in WALES.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	194	36,875	
1829	128	25,005	26,799
1830	181	38,617	
1831	121	26,302	
1832	195	45,065	
1833	130	32,156	148,988
1834	135	33,200	
1835	153	38,567	

Increase in the last four years, 22,189 tons.

HULL, GOOLE, and OTHER PORTS of YORKSHIRE.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	158	20,255	
1829	137	16,133	100,538
1830	143	20,192	
1831	272	43,958	
1832	389	51,122	
1833	173	16,110	112,744
1834	177	17,751	
1835	257	27,761	

Increase in the last four years, 12,206 tons.

TOTAL IMPORTS into the PORT of LONDON from the year 1828 to the year 1835 both inclusive.

Years.	Ships.	Weight delivered.	Total.
	No.	Tons.	Tons.
1828	6,750	1,960,559	
1829	6,992	2,018,975	8,104,101
1830	7,108	2,079,275	
1831	7,006	2,045,292	
1832	7,528	2,139,078	
1833	7,077	2,010,409	8,526,984
1834	7,404	2,078,685	
1835	7,958	2,298,812	

Increase in the last four years, 422,883 tons.

A COMPARATIVE STATEMENT of the QUANTITY of COAL brought into LONDON from the above PORTS between the Months of January and May inclusive in the years 1835 and 1836.

Years.	Newcastle.	Sunderland.	Stockton.	Blyth and Seaton.	Scotland.	Wales.	Yorkshire.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1835. January to May.	508,083	235,105	97,833	24,830	16,254	9,067	8,033
1836. January to May.	469,346	286,567	117,536	28,865	8,709	10,841	8,022
Increase	..	51,462	19,653	4,045	..	1,754	..
Decrease	38,737	..	..	..	7,545	..	11

COALS BROUGHT into the PORT of LONDON in each of the Years 1832 to 1837.

Years.	Seaborne.*	Inland.
	Tons.	Tons.
1832	2,130,608	10,742
1833	2,035,410	4,395
1834	2,045,781	1,962
1835	2,302,608	1,004
1836	2,402,474	1,199½
1837	2,543,742	2,324

* Quantities calculated on duties paid.

ACTUAL QUANTITIES SEABORNE.

Years.	Weight.
	Tons.
1832	2,139,078
1833	2,010,409
1834	2,078,625
1835	2,298,812

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Appendix No. 41.

The following Table shows the Quantity of Coal brought into London by Canal "That passed the boundary at Grove Park, Herts."*

The Grand Junction Canal, &c.—

	Tons.	cwt.
1805	2,579†	15
1806	6,010	15
1807	5,234	5
1808	6,312	0
1809	8,162	10
1810	7,614	15
1811	4,521	5
1812	3,599	5
1813	3,384	10
1814‡	3,456	0
1815	4,493	0
1816	3,692	0
1817	2,293	0
1818	1,728	0
1819	1,434	0
1820	1,128	0
1821	1,224	0
1822	1,087	0
1823	929	0
1824	1,695	0
1825	1,658	0
1826§	1,323	0
1827§	1,513	0
1828	547	5

After this we obtain a more exact return, from 1831 to 1851.

	Tons.	cwt.
1831	10,742	0
1832	6,905	5
1833	4,395	10
1834	1,862	0
1835	1,004	10
1836	1,199	5
1837	2,324	0
1838	1,686	5
1839	12,983	0
1840	22,188	10
1841	33,594	15
1842	31,519	0
1843	34,593	15
1844	72,255	15
1845	60,310	15
1846	21,872	5
1847	22,005	0
1848	19,918	10
1849	19,222	10
1850	29,479	0
1851	23,434	0

* Computed from Chaldrons at 25½ cwt. to the ton.

† Accounts and papers, House of Commons Library, vol. xviii., 1826, 1827, p. 13.

‡ "The quantity of Inland Navigation coal to Paddington is allowed 50,000 tons annually paying a duty of 10s. per ton."
A Treatise on the Coal Trade, with strictures on its abuses, and hints for amelioration, by Robert Edington, 1814.

45 Geo. 3. c. 28. 1805.

Fifty thousand tons of inland coal allowed to be brought by the Grand Junction Canal, annually, on payment of duties at Grove Park.

50 Geo. 3. c. 110. 1810.

Coal brought by Inland navigation into the River Thames allowed to be brought below Staines Bridge on payment of duties.
For additional information on the Acts of Parliament, see Appendix

Report from Select Committee on the coal trade (Port of London), B.C., June 13, 1838.
In the Appendix will be found a table giving the quantities by sea and by inland navigation in chaldrons.

§ Another return gives as follows:—

	Tons,	cwt.
1826	1,484	10
1827	1,001	0

Accounts and Papers, House of Commons Library, vol. xvii. 1829.

In the foregoing return it is difficult, if not impossible, to show the precise districts from whence the coal is brought, as also the amount from each district, as until the commencement of the year 1852 no such account was kept. However, the coals brought by the Grand Junction Canal are principally wrought from collieries situate in the counties of Derby, Warwick, Stafford, Leicester, and Nottingham.
For 1852 the return is given in more detail:—

	Tons.	cwt.
Allums	461	0
Babbington	116	5
Badderaley	1,449	15
Badgley	144	0
Bagworth	85	15
Bazzils	25	10
Bedworth	54	10
Birchwood	1,449	15
Brands Butterley	58	15
Brouch	30	0
Butterley	2,259	15
Cannel	57	10
Coke	58	0
Cotmanhay	731	10
Eastwood	29	10
Glasscot	136	0
Griff	341	10
Hasewood	59	15
Ince Hall	673	15
Kettlebrook	433	10
Loscoe	2,376	5
Moira	3,859	15
Pinxton	10,499	0
Polsworth	85	5
Reddings	1,043	5
Ridgley	47	15
Shipley	702	15
Small	27	15
Snibston	224	0
Stoneyford	5,857	10
Victoria	171	15
Wednesbury	111	5
Whitwich	240	0
Wigan	31	15
Wingerworth	57	0
Total Grand Junction Canal 1852	33,800	0
River Thames (via Staines): Nixons Merthyr (Welch	113	0
Total Canal and River, 1852	33,913	0

Appendix No. 42.

A Return showing the Quantity of Inland Coals carried on the Grand Junction Canal, and brought within the London district for the following years, viz.:—*

1831	6,704 tons.
1832	10,810 „
1833	3,798 „
1834	1,670 „
1835	920 „
1836	1,165 „
1837	2,338 „
1838	978 „
1839	12,110 „
1840	21,807 „
1841	34,137 „
1842	31,511 „
1843	34,984 „
1844	73,884 „
1845	60,280 „
1846	21,825 „
1847	22,194 „
1848	19,637 „
1849	19,365 „
1850	29,480 „
1851	24,993 „
1852	36,898 „

* Extract from Report from the Select Committee on Coal Duties (Metropolis), August 12th, 1853, page 214.

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Appendix No. 43.

Quantity of Coal brought Coastwise and by Inland Navigation into the Port of London during the years 1841 and 1842.

	1841.	1842.	1841.	1142.
	Ships.	Ships.	Tons.	Tons.
Newcastle	3,849	3,580	1,246,710	1,164,832
Sunderland	2,801	2,448	837,770	728,132
Stockton	2,019	2,067	552,531	562,302
Blythe and Seaton Sluice	372	408	98,591	100,204
Leith and other ports of Scotland	229	201	25,634	19,484
Swansea and other ports of Wales	244	249	74,315	73,669
Hull, Goole, Gainsborough, and other Yorkshire and Lincolnshire ports	673	703	66,705	69,512
Sundry places, small coal, &c.	—	—	—	4,945
Quantity which passed the boundary stone on the Grand Junction Canal at Grove Park, Herts, and the River Thames at Staines	5	—	418	31,519
Total	10,272	9,691	2,902,674	2,754,719

Appendix No. 44.

A Statement showing the Years during which the respective Railway Companies commenced paying Duties to the Corporation on account of Coals brought within the limits of the boundary; also the quantities so brought.*

Year.	North-western.	Great Western	Eastern Counties.	South-eastern.	Great Northern.	London and Brighton.	South-western.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1843	90	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
1844	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
1845	8,377	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
1846	7,348	4,350	Nil.	Nil.	Nil.	Nil.	Nil.
1847	13,957	5,379	Nil.	Nil.	Nil.	Nil.	Nil.
1848	17,881	19,901	56	49	Nil.	Nil.	Nil.
1849	19,487	Nil.	Nil.	152	Nil.	Nil.	Nil.
1850	44,865	Nil.	Nil.	5,286	4,044	Nil.	Nil.
1851	110,163	25,152	5,296	5,319	101,976	Nil.	Nil.
1852	137,078	4,596	28,815	10,652	195,865	Nil.	Nil.

* Extract from Report from the Select Committee on Coal Duties (Metropolis), August 12th, 1853, page 221.

London, Brighton, and South Coast Railway.

The London, Brighton, and South Coast Railway Company did not commence bringing coals within the London district until 1849.

Year.	Weight			
	Tons.	cwts.	qrs.	lbs.
1849	10	7	0	0
1850	10	7	0	0
1851	1	6	1	0
1852	1	6	1	0
1853	1	6	3	0
Total	13	0	0	0

Memo.:—1831 to 1840. Railway not constructed.

Great Western Railway.

Years.	Number of Tons.†			
	Coal.	Coke.	Total.	
	Tons.	Tons.	Tons.	
1838	—	—	3,006	No separate account having been kept during this period, it was ascertained by subsequent arbitration, that an annual average of 3,006 tons of coal and coke had been conveyed over the line within the London district.
1839	—	—	3,006	
1840	—	—	3,006	
1841	—	—	3,006	
1842	—	—	3,006	
1843	—	—	3,006	
1844	—	—	3,006	
1845	—	—	3,006	
1846	306	7,684	7,990	
1847	1,121	2,186	3,307	
1848	1,210	2,497	3,707	
1849	1,176	8,417	9,593	
1850	1,028	7,633	8,661	
1851	954	7,329	8,283	
1852	1,488	2,863	4,351	
Total			69,940	

† Memo.:—The Great Western Railway was not opened until the year 1838.

Eastern Counties Railway.

An Annual Return of the Quantity of Coals brought within the London district from the year 1831 to 31st December 1852.

The Eastern Counties Railway Company did not commence bringing coals within the London district until July 1850.

Year.	Tons	cwts.	qrs.
1850	214	7	3
1851	5,025	14	0
1852	27,765	10	0

The coals which the company have carried from Blackwall are not included, these being in the London district before being conveyed by the railway.

Appendix No. 45.

In the Years ending.	Annual Produce of the Duty of 10d. per Chaldron on Coals.	
	Imported into the Port of London.	By Inland Conveyance.
	£ s. d.	£ s. d.
5th July 1823	54,149 0 1	48 11 8
1824	60,708 0 5	58 8 11½
1825	63,565 8 5	83 14 9½
1826	63,354 5 8	22 10 2½
1827	60,076 0 2	61 14 9½
1828	62,546 8 0	36 5 2½
1829	65,033 13 0	38 9 4½
1830	64,577 0 11	40 19 2
1831	62,792 2 4	44 1 3
31st December 1832	71,742 6 6	454 4 0½
5th January 1833	39,734 3 4	163 19 2
1834	68,864 2 8	146 10 4
1835	67,943 12 8	62 1 4
1836	76,632 4 8	53 9 8
1837	79,875 4 8	39 19 6
1838	85,120 8 8	77 9 4

Note.—From 1st January 1833, 8d. per ton, as an equivalent for 10d. per chaldron, was directed to be paid, pursuant to the Act 1 & 2 Will. 4, c. 76, for substituting the weighing instead of measurage of coals.

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APPENDIX, No. 46.

POPULATION of ENGLAND and WALES enumerated in each of the following Years.

COUNTIES.	1801.	1811.	Per cent. Increase.*	1821.	Per cent. Increase.*	1831.	Per cent. Increase.*	1841.	Per cent. Increase.*	1851.	Per cent. Increase.*	1861.	Per cent. Increase.†
Bedfordshire	63,393	70,213	11	84,062	20	95,433	14	107,936	13	124,478	16	135,287	113
Berkshire	110,460	119,430	7	132,639	11	146,234	10	161,759	10	170,065	5	176,256	60
Buckinghamshire	108,132	118,065	9	135,133	14	146,977	9	156,429	6	163,723	5	167,998	55
Cambridgeshire	89,346	101,109	13	122,387	21	143,955	18	164,459	14	185,406	13	176,016	97
Cheshire	192,305	227,061	18	270,098	19	334,391	24	395,660	18	455,725	15	505,428	163
Cornwall	192,281	220,525	14	261,045	18	301,306	15	342,159	14	355,558	4	369,390	92
Cumberland	117,230	133,665	14	156,124	17	169,262	8	178,038	5	195,492	10	205,276	75
Derbyshire	161,567	185,497	14	213,651	15	237,170	11	272,202	15	296,084	9	339,227	110
Devonshire	340,308	382,778	12	428,417	15	493,908	15	532,959	7	567,098	6	584,373	72
Dorsetshire	114,452	124,718	9	144,930	16	159,385	10	175,054	10	184,207	5	188,789	65
Durham	149,384	165,293	10	193,511	17	289,256	24	307,263	29	390,997	27	508,666	241
Essex	227,682	252,473	11	289,424	15	317,507	10	344,979	9	369,518	7	404,851	78
Gloucestershire	250,723	285,955	14	336,190	18	387,398	15	431,495	11	458,805	6	485,770	94
Hampshire, County of Southampton	219,290	246,514	12	282,897	15	313,976	11	354,682	12	405,370	13	461,815	120
Herefordshire	88,436	93,526	6	102,669	10	110,617	8	113,272	2	115,489	2	123,712	40
Hertfordshire	97,393	111,225	14	129,731	17	142,844	10	156,660	10	167,298	7	173,280	78
Huntingdonshire	37,568	42,208	12	48,946	16	53,192	9	58,549	10	64,183	10	64,250	71
Kent	308,667	371,701	20	427,224	15	479,558	12	549,353	12	615,766	11	733,887	138
Lancashire	673,486	828,499	23	1,052,948	27	1,336,854	27	1,667,054	24	2,031,236	20	2,429,440	261
Leicestershire	130,082	150,559	15	174,571	16	197,003	13	215,867	10	230,308	7	237,412	82
Lincolnshire	208,625	237,634	14	283,058	22	317,465	12	362,602	14	407,222	12	412,246	98
Middlesex (with the City of London)	818,129	953,774	16	1,145,057	20	1,358,330	19	1,576,636	16	1,886,576	20	2,206,485	170
Monmouthshire	45,568	62,105	36	75,801	22	96,126	29	134,368	36	157,418	17	174,633	283
Norfolkshire	273,479	291,947	7	344,368	18	390,054	13	412,664	6	442,714	7	434,798	59
Northamptonshire	131,525	141,353	7	163,097	15	179,336	10	199,228	11	213,330	7	227,704	73
Northumberlandshire	168,078	183,269	19	212,589	15	236,959	11	266,620	12	303,568	14	343,025	104
Nottingham	140,350	162,964	16	186,873	15	225,327	21	249,910	11	270,427	8	293,867	109
Oxfordshire	111,977	120,376	7	138,224	15	153,526	11	163,127	6	170,439	5	170,944	53
Rutland	16,300	16,380	·	18,487	13	19,235	5	21,302	10	22,963	8	21,861	34
Shropshire	169,248	184,973	9	198,311	7	213,518	8	225,320	6	239,341	8	240,959	42
Somersetshire	273,577	302,336	10	355,789	17	403,796	13	435,599	8	443,916	2	444,873	63
Staffordshire	242,693	294,540	21	345,972	17	409,480	18	509,472	24	608,716	20	746,943	208
Suffolk	214,404	233,963	9	271,451	16	296,317	9	315,073	6	337,215	7	337,070	57
Surrey	268,233	323,951	20	399,417	23	486,454	22	584,036	20	683,062	17	831,093	210
Sussex	159,471	190,343	19	233,328	23	272,644	17	300,075	10	336,844	13	363,735	128
Warwickshire	206,798	238,906	19	274,483	20	336,645	23	401,706	19	475,013	19	551,855	172
Westmoreland	40,805	45,922	12	51,359	12	55,041	7	56,454	3	58,287	3	60,817	49
Wiltshire	183,320	191,853	4	219,574	14	237,244	8	256,280	8	254,221	−1	249,311	36
Worcestershire	146,441	168,982	15	194,074	15	223,655	15	248,460	12	276,926	12	307,397	110
Yorkshire, East Riding	111,192	133,975	20	154,646	15	168,891	9	194,936	15	220,963	12	240,227	116
North Riding	158,927	170,127	7	188,178	11	198,206	5	204,701	6	215,214	5	245,154	54
West Riding	572,168	662,875	16	809,363	22	984,609	22	1,163,580	18	1,335,495	14	1,507,796	164
City of York	16,846	19,099	13	21,711	14	26,260	21	28,842	10	36,303	26	40,483	140
Total of ENGLAND	8,350,859	9,553,021		11,281,863		13,090,523		14,997,427		16,921,888		18,954,444	
Anglesea	33,806	37,045	9	45,063	22	48,325	7	50,891	5	57,327	12	54,609	62
Brecknockshire	32,325	37,735	16	43,826	16	47,763	9	55,608	16	61,474	11	61,627	91
Cardiganshire	42,956	50,260	17	57,784	15	64,780	12	68,766	6	70,796	3	72,245	68
Carmarthenshire	67,317	77,217	14	90,239	17	100,740	12	106,326	6	110,632	4	111,796	66
Carnarvonshire	41,521	49,655	19	58,099	17	66,818	15	81,098	21	87,870	8	95,694	130
Denbighshire	60,299	64,249	6	76,428	19	83,665	8	88,478	7	92,588	5	100,778	67
Flintshire	39,469	45,937	16	53,893	17	60,244	12	66,919	11	68,156	2	69,737	77
Glamorganshire	70,879	85,067	19	102,073	20	126,612	24	171,188	35	231,849	35	317,753	348
Merionethshire	29,506	30,854	4	34,382	11	35,315	3	39,332	11	38,845	−1	38,963	32
Montgomeryshire	48,184	52,184	8	60,245	15	66,844	11	69,607	4	67,335	−3	66,919	39
Pembroke	56,280	60,615	8	73,788	22	81,425	10	88,044	8	94,140	6	96,278	71
Radnorshire	19,135	20,417	7	22,533	10	24,743	10	25,458	3	24,716	−3	25,382	33
Total of WALES	541,677	611,235		718,353		806,274		911,705		1,005,721		1,111,780	

* The figures in *Italic* in these columns show the increase per cent. on the previous Census (i.e.) of each ten years.
† The figures in *Italic* in this column show the increase per cent. in 60 years, 1801 to 1861.

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SHIPMENTS of COAL from the ENGLISH, WELSH, and SCOTCH PORTS, from 1819 to 1850.

APPENDIX No. 47.

BRISTOL SHIPMENTS.

Years.	Shipments Coastwise.		Shipments Foreign, including Ireland.		Total Shipments.	
	Coal.	Culm.	Coal.	Culm.	Coal.	Culm.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819	28	63	3,620	—	3,648	63
1820	16	73	2,909	—	2,925	73
1821	134	—	2,409	—	2,543	—
1822	644	—	4,133	—	4,777	8
1823	347	—	4,080	8	4,427	—
1824	90	—	5,082	—	5,172	—
1825	94	—	4,892	—	4,986	—
1826	179	—	5,500	—	5,679	—
1827	419	—	6,239	—	6,658	—
1828	344	—	5,203	—	5,547	—
1829	—	—	6,517	—	6,517	—
1830	—	—	6,517	—	6,517	—
Total	2,295	136	57,101	8	59,396	144

	Tons.
Increase coastwise in 12 years -	225
Do. foreign in do. - -	2,897
Total increase in do. - -	2,806
Increase per cent. - -	77·56

Years.	Shipments Coastwise.		Shipments Foreign, including Ireland.		Total Shipments.	
	Coal.	Culm.	Coal.	Culm.	Coal.	Culm.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1831	—	—	6,633	—	6,633	—
1832	—	—	5,280	—	5,280	—
1833	1,296	—	5,370	—	6,666	—
1834	—	—	5,420	—	5,420	—
1835	2,756		7,294		10,050	
1836	3,888		7,111		10,999	
1837	4,974		12,085		17,059	
1838	3,961		7,762		11,718	
1839	3,710		6,874		10,584	
1840	5,300		8,787		12,587	
Total	24,875		72,615		96,990	

	Tons.
Increase coastwise in 6 years -	1,044
Do. foreign in 10 years -	2,155
Total increase in 10 years - -	5,955
Increase per cent. in 10 years -	59·63

Years.	Shipments Coastwise.		Shipments Foreign, including Ireland.		Total Shipments.	
	Coal.	Culm.	Coal.	Culm.	Coal.	Culm.
	Tons.		Tons.		Tons.	
1841	4,614		7,277		11,891	
1842	2,481		8,188		10,669	
1843	2,241		8,023		10,264	
1844	2,772		6,423		9,195	
1845	1,735		6,976		8,711	
1846	1,869		7,994		9,863	
1847	3,055		7,913		10,968	
1848	2,665		9,294		11,959	
1849	2,187		13,292		15,479	
1850	2,242		11,305		13,547	
Total	25,861		86,685		112,546	

	Tons.
Decrease coastwise - -	2,372
Increase foreign - - -	4,028
Total increase - - -	1,656
Increase per cent. - - -	15·90

APPENDIX No. 48.

GLOUCESTER (including Lydney) SHIPMENTS.

Years.	Shipped Coastwise and Ireland.	Shipped Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	3,485	—	3,485
1820	7,662	—	7,662
1821	15,615	—	15,615
1822	20,767	—	20,767
1823	22,799	—	22,799
1824	19,724	491	20,215
1825	14,009	68	14,077
1826	18,362	—	18,362
1827	18,591	—	18,591
1828	6,088	10	6,098
1829	—	—	—
1830	—	98	98
Total -	147,102	667	147,769

	Tons.
Increase 10 years coastwise -	2,603
Decrease foreign - - - -	393
Total 13 years increase - -	2,613
Increase per cent. - - -	74·97

Years.	Shipped Coastwise and Ireland.	Shipped Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	463	463
1832	—	140	140
1833	39,256	546	39,802
1834	—	546	546
1835	36,429	697	37,126
1836	51,986	521	52,507
1837	75,227	600	75,827
1838	69,759	726	70,485
1839	74,786	3,058	77,844
1840	105,758	2,290	108,048
Total -	453,201	9,587	462,788

	Tons.
Increase in 6 years coastwise -	69,329
Do. do. foreign -	1,593
Total increase - - -	70,922
Increase per cent. - - -	19·103

Years.	Shipped Coastwise and Ireland.	Shipped Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	82,529	2,078	84,607
1842	92,667	2,926	95,613
1843	84,773	1,416	86,189
1844	111,420	477	111,897
1845	84,722	600	85,322
1846	104,966	2,893	107,859
1847	110,633	1,569	112,202
1848	118,108	1,985	119,993
1849	88,184	1,088	89,272
1850	85,707	—	85,707
Total -	963,729	14,932	978,661

	Tons.
Increase coastwise - -	3,178
Decrease foreign - - -	990
Increase, total - - -	2,188
Increase per cent. - - -	2·58

APPENDIX No. 49.

SOUTH WALES.

SWANSEA SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Ireland and Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	159,181	29,974	189,155
1817	167,251	57,784	225,035
1818	190,023	34,321	224,343
Total -	516,454	122,079	638,533

The shipment of coal and culm were not separated until 1819.

	Tons.
Increase in 3 years coastwise -	40,841
Do. do. foreign -	13,347
Total increase - - -	35,188
Increase per cent. - - -	23·88

Years.	Shipments Coastwise.		Shipments Ireland and Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819	99,542	85,063	925	292	100,377	85,355
1820	95,678	135,244	786	267	96,464	135,511
1821	79,776	127,057	1,172	115	80,948	127,173
1822	109,253	115,948	1,535	132	110,788	116,080
1823	107,503	115,623	1,425	113	109,038	115,736
1824	136,801	155,112	1,547	225	138,348	155,337
1825	128,935	104,405	1,423	157	130,358	104,562
1826	130,388	186,408	3,703	353	134,091	186,761
1827	107,035	167,315	3,393	217	110,428	167,532
1828	122,923	165,308	3,552	127	126,475	165,435
1829	—	—	4,924	—	4,924	—
1830	—	—	6,278	125	6,278	125
Total	1,117,834	1,357,477	30,663	2,125	1,148,517	1,359,600

	COAL.	CULM.
	Tons.	Tons.
Increase in 10 years coastwise -	22,381	30,940
Do. do. foreign -	5,353	Decrease 165
Total increase - - -	26,098	30,075
Increase per cent. - - -	26	26·89

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Years.	Shipments Coastwise.		Shipments Ireland and Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1831	—	—	7,709	304	7,709	304
1832	—	—	7,963	235	7,963	235
1833	139,884	246,679	13,000	501	142,884	247,180
1834	—	—	—	—	—	—
1835	136,350	221,782	21,629	2,112	157,979	223,894
1836	163,967	223,357	17,620	904	181,607	224,261
1837	216,540	275,426	34,030	965	250,570	276,391
1838	199,288	276,977	28,230	300	227,518	277,277
1839	227,500	259,292	25,291	393	252,791	259,685
1840	213,790	246,411	32,911	178	246,701	246,589
Total	1,297,339	1,749,924	188,383	5,892	1,475,722	1,755,816

COAL.

	Tons.
Increase coastwise - - -	200,155
Do. foreign - - -	11,282
Total increase - -	88,792
Increase per cent. - -	56·16

CULM.

	Tons.
Increase coastwise - - -	24,629
Decrease foreign - - -	1,934
Total increase - - -	22,695
Increase per cent. - - -	7465·59

Years.	Shipments Coastwise.		Shipments Ireland and Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	200,559	249,560	28,781	215	229,340	249,775
1842	226,019	245,222	39,451	571	265,470	245,793
1843	207,299	194,594	32,521	2,220	239,820	196,814
1844	222,481	199,095	34,599	5,700	257,080	204,795
1845	263,568	215,860	39,153	3,986	302,721	219,846
1846	258,297	196,053	35,607	2,928	293,904	198,981
1847	212,970	160,337	42,665	4,050	255,635	164,387
1848	224,325	168,046	39,399	2,715	263,724	170,761
1849	181,050	123,857	34,896	1,742	215,946	125,599
1850	207,298	110,270	38,649	2,232	245,947	112,502
Total	2,203,866	1,862,894	365,721	26,359	2,569,587	1,889,253

COAL.

	Tons.
Increase in 10 years coastwise -	6,739
Do. do. foreign -	9,868
Total do. increase -	16,607
Increase per cent. - -	7·24

CULM.

	Tons.
Decrease in 10 years coastwise -	139,290
Increase do. foreign -	2,017
Total do. decrease -	137,273
Decrease per cent. - -	122·01

CARDIFF and NEWPORT SHIPMENTS.

The Returns were given together until 1819.

Years.	Shipments Coastwise.	Shipped to Ireland and Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	177,044	75,199	252,243
1817	207,753	90,090	297,843
1818	218,800	95,414	314,214
Total -	603,597	260,703	864,300

	Tons.
Increase coastwise in 3 years -	41,756
Do. foreign - - -	20,215
Total increase - - -	61,971
Increase per cent - -	24·56

CARDIFF SHIPMENTS of COAL.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	133,669	670	134,339
1820	85,427	—	85,427
1821	90,252	1,143	91,395
1822	98,066	445	99,511
1823	114,830	2,108	116,938
1824	19,246	467	19,713
1825	24,144	374	13,994
1826	21,683	952	13,500
1827	24,842	406	12,955
1828	30,147	281	30,378
1829	—	131	131
1830	—	711	711
Total -	643,306	7,638	650,944

	Tons.
Decrease 10 years coastwise -	103,522
Increase 12 foreign - -	41
Total decrease - - -	103,961
Decrease per cent. - -	342·22

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	726	726
1832	—	1,052	1,052
1833	138,272	1,521	1,521
1834	—	—	—
1835	123,279	972	124,251
1836	130,989	2,251	133,240
1837	169,248	3,840	173,088
1838	123,614	2,455	126,069
1839	145,057	4,879	149,936
1840	162,283	3,826	166,109
Total -	992,742	21,522	1,014,264

	Tons.
Increase in 6 years coastwise -	39,004
Do. do. foreign -	2,854
Total do. increase -	41,858
Increase per cent. - - -	33·68

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	156,407	4,374	160,781
1842	238,319	7,510	245,829
1843	267,303	12,781	280,084
1844	329,569	23,027	352,596
1845	417,831	33,096	450,927
1846	442,065	45,102	487,167
1147	482,726	31,032	513,758
1848	546,961	117,674	664,635
1849	488,772	171,686	660,458
1850	497,695	233,634	731,329
Total -	3,817,648	729,926	4,547,574

	Tons.
Increase in 10 years coastwise -	341,288
Do. do. foreign -	229,260
Total do. increase -	570,548
Increase per cent. - - -	354·86

NEWPORT SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	198,662	—	198,662
1820	174,104	711	174,815
1821	211,997	—	211,997
1822	234,573	—	234,573
1823	257,434	—	257,434
1824	374,996	763	375,759
1825	372,456	2,126	374,582
1826	401,319	2,801	404,120
1827	375,671	4,302	379,973
1828	420,964	1,818	422,782
1829	—	1,606	1,606
1830	—	1,930	1,930
Total -	3,017,176	16,057	3,033,233

	Tons.
Increase in 10 years coastwise	227,302
Do. in 7 years foreign -	1,167
Total increase in 10 years -	229,120
Increase per cent. - -	118·25

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Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	4,698	4,698
1832	—	5,244	5,244
1833	384,774	2,609	2,609
1834	—	—	—
1835	443,651	2,823	446,474
1836	415,954	5,578	421,532
1837	480,870	7,183	488,053
1838	430,618	8,745	439,363
1839	470,830	13,025	483,855
1840	462,398	7,256	469,654
Total	3,109,085	57,171	3,166,250

	Tons.
Increase in 6 years coastwise	38,747
Do. do. foreign	4,433
Total do. increase	43,180
Increase per cent.	9·67

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	506,078	14,788	520,866
1842	503,308	52,445	555,753
1843	495,419	58,694	554,113
1844	469,396	148,881	618,284
1845	485,402	149,890	635,292
1846	493,582	123,595	617,177
1847	436,099	116,098	552,197
1848	429,217	124,885	554,102
1849	402,078	108,705	510,783
1850	426,439	125,245	551,684
Total	4,647,018	1,023,233	5,670,251

	Tons.
Decrease coastwise	79,639
Increase foreign	110,457
Total increase	30,818
Increase per cent.	5·90

Llanelly Shipments.

Years.	Shipments Coastwise.	Shipments Ireland and Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	29,418	15,480	44,898
1817	38,512	26,527	65,039
1818	34,570	18,427	52,997
Total	102,500	60,434	162,934

Coal and culm were not separated until 1819.

	Tons.
Increase 3 years coastwise	5,142
Do. do. foreign	2,947
Total increase 3 years	8,099
Increase per cent.	18·03

Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819	54,405	7,867	3,696	—	58,101	7,867
1820	57,605	4,823	2,782	22	60,427	4,845
1821	68,962	1,506	925	—	69,187	1,506
1822	70.014	2,167	1,704	—	71,718	2,167
1823	62,366	2,016	1,337	—	63,703	2,016
1824	68,739	5,278	1,890	—	70,629	5,278
1825	72,146	2,981	1,102	—	73,248	2,981
1826	65,557	7,630	2,843	—	68,400	7,630
1827	68.797	5,336	2,025	—	70,822	5,336
1828	70,196	6,594	1,149	—	71,345	6,594
1829	—	—	1,952	—	1,952	—
1830	—	—	3,819	36	3,819	36
Total	658,177	46,198	25,174	58	683,351	46,256

Coal.

	Tons.
Increase in 10 years coastwise	15,791
Do. in 12 years foreign	123
Total increase in 10 years	13,244
Increase per cent.	22·79

Culm.

	Tons.
Decrease 10 years coastwise	1,273

Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1831	—	—	5,817	—	5,817	—
1832	—	—	4,740	—	4,740	—
1833	78,886	18,441	7,109	—	85,995	18,441
1834	—	—	—	—	—	—
1835	74,919	11,161	11,287	440	86,206	11,601
1836	76,957	8,342	19,759	—	96,716	8,342
1837	101,919	16,323	30,268	—	132,187	16,323
1838	116,061	20,465	25,962	—	142,023	20,465
1839	114,193	27,646	24,890	—	139,083	27,646
1840	151,750	41,019	19,275	—	171,025	41,019
Total	714,685	143,397	149,107	440	863,792	143,837

Coal.

	Tons.
Increase in 6 years coastwise	76,131
Do. do. foreign	7,988
Total do. increase	84,819
Increase per cent.	731·13

Culm.

	Tons.
Increase 6 years coastwise	29,858
Total increase	29,858
Increase per cent.	34·64

Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	125,151	37,968	15,079	—	140,230	37,968
1842	128,134	41,584	9,802	40	137,936	41,624
1843	127,304	43,304	10,598	—	137,902	43,304
1844	125,074	69,515	19,524	630	144,598	70,145
1845	145,597	62,995	11,452	—	157,049	62,995
1846	169,006	67,155	13,828	100	182,834	67,255
1847	165,650	38,741	14,178	—	179,828	38,741
1848	192,222	47,664	15,141	110	207,363	47,774
1849	158,160	52,961	11,324	100	169,484	53,061
1850	154,976	56,367	17,049	459	172,025	56,826
Total	1,491,274	518,254	137,975	1,439	1,629,249	519,693

Coal.

	Tons.
Increase in 10 years coastwise	29,825
Do. do. foreign	1,970
Total do. increase	31,795
Increase per cent.	22·67

Culm.

	Tons.
Increase in 10 years coastwise	18,399
Do. do. foreign	419
Total do. increase	18,818
Increase per cent.	49·56

Pembroke Shipments.*

Years.	Shipments Coastwise.	Shipments Ireland and Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	27,532	271	27,803
1817	21,956	3,333	25,289
1818	28,970	3,462	32,432
Total	78,458	7,066	85,524

	Tons.
Increase coastwise, 3 years	1,488
Increase foreign	3,191
Total increase	4,679
Increase per cent.	16·64

Milford Shipments.*

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	—	316	316
1817	—	1,310	1,310
1818	—	269	269
Total	—	1,895	1,895

* Before 1819 coal and culm were not separated.

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Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1819	11,807	16,749	—	—	11,807	16,749
1820	11,033	8,851	—	26	11,033	8,877
1821	10,236	8,847	—	42	10,236	8,889
1822	9,693	8,538	—	—	9,693	8,538
1823	7,000	8,214	—	71	7,000	8,285
1824	7,305	10,280	—	—	7,305	10,280
1825	8,772	12,557	—	100	8,772	12,657
1826	8,640	13,653	20	35	8,660	13,688
1827	7,768	13,304	—	—	7,768	13,304
1823	7,400	8,376	24	—	7,424	8,376
1829	—	—	148	—	148	—
1830	—	—	10	—	10	—
Total	89,754	109,369	2,097	274	91,751	109,643

COAL.

	Tons.
Decrease coastwise, 10 years -	4,407
Total decrease - - -	4,383
Decrease per cent. - - -	59·13

CULM.

	Tons.
Decrease coastwise - -	8,373
Total decrease - - -	8,373
Decrease per cent. - -	99·96

Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1831	—	—	—	—	—	—
1832	—	—	214	—	214	—
1833	12,631	29,773	—	—	12,631	29,773
1834	—	—	—	—	—	—
1835	15,674	28,068	—	—	15,674	28,068
1836	14,992	31,685	—	—	14,992	31,685
1837	14,253	41,592	102	120	14,354	41,712
1838	18,410	42,651	210	—	18,620	42,651
1839	17,731	45,490	—	—	17,731	45,490
1840	20,964	55,814	372	39	21,336	55,853
Total	114,644	275,073	898	159	115,542	275,232

COAL.

	Tons.
Increase coastwise - -	5,280
Do. foreign - - -	270
Total increase - - -	5,550
Increase per cent. - - -	35·16

CULM.

	Tons.
Increase coastwise - - -	27,746
Decrease foreign - - -	81
Total increase - - -	27,665
Increase per cent. - -	28·56

Years.	Shipments Coastwise.		Shipments Foreign.		Total Shipments.	
	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.	Coal.	Culm or Anthracite.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	16,922	52,589	—	—	16,922	52,589
1842	15,581	54,997	—	—	15,581	54,997
1843	15,428	45,024	312	819	15,740	45,843
1844	22,069	45,605	—	—	22,069	45,605
1845	19,583	46,126	394	—	19,977	46,126
1846	20,939	47,552	288	24	21,227	47,576
1847	17,319	35,394	439	—	17,758	35,394
1848	16,967	38,535	265	—	17,232	38,535
1849	13,684	37,718	411	—	14,095	37,718
1850	16,270	31,288	231	—	16,501	31,288
Total	174,783	434,818	2,340	843	177,123	435,661

COAL.

	Tons.
Decrease coastwise - - -	652
Do. foreign - - -	81
Total decrease - - -	733
Decrease per cent. - -	4·33

CULM.

	Tons.
Decrease coastwise - -	21,301
Do. foreign - - -	795
Total decrease - - -	22,096
Decrease per cent. - - -	42·01

CARDIGAN SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1821	64	—	—
1831	—	35	—

BEAUMARIS AND CARNARVON SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Ireland and Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1816	—	137	—
1817	49	233	—
1818	33	24	—
Total -	82	394	—

	Tons.
Decrease in 2 years coastwise -	16
Increase in 3 years foreign -	113

BEAUMARAIS SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1821	223	—	—
1822	152	42	—
1827	—	85	—
1828	—	24	—
1829	—	—	—
1830	—	56	—
1831	—	—	—
1832	—	62	—
1833	—	41	—
Total -	375	310	—

APPENDIX No. 50.

CHESHIRE AND LANCASHIRE.

CHESTER SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	49,212	383	49,595
1820	46,218	387	46,605
1821	45,301	617	45,918
1822	52,238	638	52,876
1823	53,316	781	54,097
1824	48,581	505	49,086
1825	37,644	1,408	39,052
1826	39,125	425	39,550
1827	39,542	422	39,964
1828	44,855	670	45,525
1829	—	446	446
1830	—	252	252
Total -	456,030	6,936	462,966

	Tons.
Decrease in 10 years coastwise -	4,359
Do. in 12 years foreign -	131
Total decrease in 10 years -	4,072
Decrease per cent. - -	8·94

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	497	497
1832	—	1,115	1,115
1833	69,346	1,291	70,637
1834	—	—	—
1835	79,207	1,851	81,058
1836	91,239	2,273	93,512
1837	105,656	3,175	108,831
1838	93,268	3,782	97,050
1839	88,111	3,921	92,032
1840	86,227	2,986	89,213
Total -	613,054	20,831	633,885

	Tons.
Increase in 6 years coastwise -	7,020
Do. do. foreign -	1,135
Total do. increase -	8,155
Increase per cent. - -	10·06

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Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	89,477	4,310	93,787
1842	76,781	5,399	82,180
1843	68,849	4,653	73,482
1844	70,312	2,528	72,840
1845	94,183	580	94,763
1846	96,198	1,153	97,351
1847	89,326	280	89,606
1848	100,340	—	100,340
1849	93,149	112	93,261
1850	95,970	2,230	98,200
Total -	874,565	21,245	895,810

	Tons.
Increase coastwise - - -	6,493
Decrease foreign - - -	2,080
Total increase - - -	4,413
Increase per cent. - - -	4·75

Liverpool Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	68,869	27,391	96,260
1820	78,876	31,579	110,455
1821	79,183	20,052	99,235
1822	74,957	24,345	99,302
1823	75,699	41,875	117,574
1824	78,174	41,564	119,738
1825	75,017	60,827	135,844
1826	85,394	57,168	142,562
1827	66,771	62,200	128,971
1828	70,066	55,716	125,782
1829	—	46,668	46,668
1830	—	53,232	53,232
Total -	753,006	522,617	1,275,623

	Tons.
Increase 10 years coastwise -	1,197
Do. 12 years foreign -	25,841
Total increase 10 years - -	29,522
Increase per cent. - -	30·66

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	44,982	44,982
1832	—	58,898	58,898
1833	39,799	50,561	90,360
1834	—	—	—
1835	No account kept between 1835 and 1842.	61,542	61,542
1836		90,024	90,024
1837		95,188	95,188
1838		95,648	95,648
1839		103,630	103,630
1840		109,546	109,546
Total -	39,799	710,019	749,818

	Tons.
Increase in 6 years foreign -	48,004
Total increase - - -	48,004
Increase per cent. - - -	78·00

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	(See above.)	119,949	119,949
1842	56,218	117,718	173,936
1843	35,861	86,022	121,883
1844	28,217	75,479	103,696
1845	29,289	123,456	152,745
1846	13,383	97,822	111,205
1847	15,390	106,197	121,587
1848	18,393	113,554	131,947
1849	25,871	153,575	179,446
1850	117,209	260,943	378,152
Total -	339,831	1,254,515	1,594,346

	Tons.
Increase coastwise - - -	60,991
Do. foreign - -	140,994
otal increase - - -	201,985
Increase per cent. - -	168·39

Runcorn Shipments from 1847.*

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1847	63,766	630	64,396
1848	64,777	110	64,887
1849	61,941	589	62,530
1850	—	—	—
Total -	190,484	1,329	191,813

* No returns are given earlier than 1847; whether the shipments of coal commenced in that year is not known.

	Tons.
Decrease coastwise - -	1,825
Do. foreign - - -	41
Total decrease - -	1,866
Decrease per cent. - -	2·89

Preston Shipments since 1843.*

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1843	33,523	1,288	34,811
1844	32,682	513	33,195
1845	39,785	1,538	41,323
1846	41,876	794	42,670
1847	33,830	763	34,593
1848	49,314	647	49,961
1849	31,332	1,730	33,062
1850	43,602	919	44,521
Total -	305,944	8,192	314,136

* There are no returns of any shipments before this date.

	Tons.
Increase coastwise - -	10,079
Decrease foreign - -	369
Total increase - - -	9,710
Increase per cent. - -	27·88

Fleetwood Shipments from 1839.*

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1836	—	—	—
1837	—	—	—
1838	—	—	—
1839	22,686	107	22,793
1840	22,065	170	22,235
Total -	44,751	277	45,028

* There are not any returns obtainable before 1839.

	Tons.
Decrease coastwise - -	621
Increase foreign - - -	63
Total decrease - - -	558
Decrease per cent. - -	2·44

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	24,109	432	24,541
1842	29,633	1,198	30,831
1843	33,523	1,288	34,811
1844	—	—	—
1845	—	—	—
1846	—	—	—
1847	—	—	—
1848	—	—	—
1849	16,130	—	16,130
1850	18,819	800	19,619
Total -	122,214	3,718	125,932

	Tons.
Decrease coastwise - -	5,290
Increase foreign - -	368
Total decrease - - -	4,922
Decrease per cent. - -	20·05

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LANCASTER SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	13,763	356	14,113
1820	13,032	285	13,317
1821	13,286	63	13,349
1822	11,201	189	11,390
1823	10,398	64	10,462
1824	11,234	43	11,277
1825	10,884	207	11,091
1826	13,765	—	13,765
1827	14,438	78	14,516
1828	22,784	208	22,992
1829	—	298	298
1830	—	422	422
Total -	133,785	2,207	135,992

	Tons.
Increase coastwise 10 years -	9,021
Decrease foreign 12 years - -	66
Total decrease 12 years -	14,691
Decrease per cent - -	348·127

A small quantity of anthracite never exceeding 50 chaldrons is is included in those shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	135	135
1832	—	441	441
1833	18,692	577	19,379
1834	—	—	—
1835	14,530	1,519	16,049
1836	2,794	480	3,274
1837	18,809	—	18,809
1838	13,435	200	13,635
1839	2,161	544	2,705
1840	2,570	—	2,570
Totals -	72,991	3,896	76,887

	Tons.
Decrease coastwise - - -	11,960
Do. foreign - - -	975
Total decrease - - -	12·935
Decrease per cent. - -	80·59

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	1,791	660	2,451
1842	2,796	1,042	3,838
1843	2,626	110	2,736
1844	944	500	1,444
1845	1,761	278	2,039
1846	4,000	440	4,440
1847	4,324	533	4,857
1848	4,793	820	5,613
1849	3,488	90	3,578
1850	3,764	—	3,764
Total -	30,287	4,473	34,760

	Tons.
Increase coastwise - - -	1,973
Decrease foreign - - -	570
Total increase - - -	1,403
Increase per cent - - -	57·24

APPENDIX No. 51.

CUMBERLAND COALFIELD.

WHITEHAVEN SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	242,605	13,451	256,056
1820	242,066	11,502	253,568
1821	126,434	11,012	137,436
1822	255,224	12,860	268,084
1823	284,531	13,106	297,629
1824	284,122	13,108	297,230
1825	274,146	13,322	287,468
1826	281,770	14,165	295,935
1827	295,664	11,682	307,346
1828	266,956	10,457	277,413
1829	—	13,159	13,159
1830	—	16,040	16,040
Total -	2,613,518	153,846	2,767,364

	Tons.
Increase in 10 years coastwise	24,351
Do. in 12 years foreign -	2,609
In 10 years total increase -	21,377
Increase per cent -	8·34

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	15,869	15,869
1832	—	17,693	17,693
1833	346,341	17,187	363,528
1834	—	—	—
1835	354,098	19,606	373,704
1836	403,332	20,172	423,504
1837	409,493	28,190	437,683
1838	394,798	28,021	422,819
1839	439,188	22,616	461,804
1840	423,379	24,318	447,697
Total -	2,770,629	195,672	2,964,301

	Tons.
Increase in 6 years coastwise -	69,281
Do. do. foreign -	4,712
Total do. increase -	73,993
Increase per cent. - -	1979

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	451,370	23,478	474,848
1842	301,247	19,106	320,353
1843	300,948	17,666	318,614
1844	299,407	12,734	312,141
1845	348,307	1,084	349,391
1846	326,668	1,428	328,096
1847	308,846	2,423	311,269
1848	295,565	2,914	298,479
1849	330,495	2,094	332,589
1850	236,806	2,035	238,841
Total -	3,199,661	84,960	3,284,621

	Tons.
Decrease coastwise - - -	214,562
Do. foreign - -	21,445
Total decrease - - -	236,007
Decrease per cent. - -	98·85

MARYPORT SHIPMENTS from 1842 to 1850.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons	Tons.	Tons.
1835	—	—	—
1836	—	—	—
1837	—	—	—
1838	—	—	—
1839	—	—	—
1840	—	—	—
1841	—	—	—
1842	141,391	3,903	145,294
1843	124,700	2,469	127,169
1844	162,038	1,858	163,896
1845	183,549	90	183,639
1846	218,838	322	219,160
1847	195,159	1,176	196,335
1849	183,239	1,118	184,357
1849	197,061	1,000	198,061
1850	190,640	1,243	191,883
Total -	1,596,615	12,979	1,609,594

No returns earlier than 1842 can be found.

	Tons.
Increase coastwise - -	49,249
Decrease foreign - - -	2,660
Total increase - - -	46,589
Increase per cent. - - -	32·06

APPENDIX No. 52.

YORKSHIRE COALFIELD.

GAINSBOROUGH SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1835	—	—	—
1836	—	—	—
1837	—	—	—
1838	—	—	—
1839	—	—	—
1840	—	—	—
1841	2,857	1,268	4,125
1842	2,139	—	2,139
1843	9,529	593	10,122
1844	12,375	322	12,697
1845	4,753	115	4,897
1846	2,336	170	2,506
1847	6,480	35	6,515
1848	3,214	32	3,246
1849	8,683	—	8,683
1850	7,817	—	7,817
Total -	60,212	2,535	162,747

	Tons.
Increase coastwise - - -	4,960
Decrease foreign - - -	1,236
Total increase - - -	3,734
Increase per cent. - -	90·27

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Scarborough Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1839	—	30	30
1840	—	55	55
1841	—	15	15
Total -	—	100	100

Hull and Goole Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	11,246	2,249	13,495
1820	18,834	254	19,088
1821	19,900	483	20,383
1822	27,888	288	28,176
1823	25,955	196	26,151
1824	22,712	881	23,593
1825	19,031	558	19,589
1826	18,999	273	19,272
1827	25,829	294	26,123
1828	40,467	1,090	41,557
1829	—	1,629	1,629
1830	—	3,474	3,474
Total -	230,861	11,669	242,530

	Tons.
Increase in 10 years coastwise -	29,221
Do. foreign in 12 years -	1,225
Total increase in 10 years -	28,062
Increase per cent. - -	207·94

Hull Shipments of Coal.

(Goole is separated from Hull after this date.)

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1831	—	2,789	2,789
1832	—	6,398	6,398
1833	9,876	7,463	17,339
1834	—	—	—
1835	7,752	10,078	17,830
1836	11,434	15,642	27,076
1837	10,897	6,225	17,122
1838	11,881	14,510	26,391
1839	13,295	28,426	41,711
1840	12,909	29,349	42,318
Total -	78,094	120,880	198,974

	Tons.
Increase in 6 years coastwise -	5,217
Do. foreign - -	19,271
Total increase - -	24,488
Increase per cent. -	137·34

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	7,226	37,924	45,150
1842	12,982	47,614	60,596
1843	21,291	42,957	64,248
1844	27,675	45,400	73,075
1845	18,246	42,789	61,035
1846	8,462	48,442	56,904
1847	7,889	41,741	49,630
1848	11,229	46,138	57,367
1849	9,313	48,039	57,352
1850	12,776	60,817	73,593
Total -	137,809	461,861	599,670

	Tons.
Increase in 10 years coastwise -	5,550
(Do.) foreign - -	23,893
Total increase - -	28,443
Increase per cent. -	63·00

Goole Shipments.*

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1828	—	—	—
1829	—	—	—
1830	—	4,256	4,256
1831	—	3,430	3,430
1832	—	4,156	4,156
1833	115,027	2,660	117,687
1834	—	—	—
1835	121,445	1,899	123,344
1836	108,597	2,910	111,507
1837	94,600	4,749	99,349
1838	87,929	4,153	92,075
1839	132,475	4,802	137,277
1840	146,376	3,026	149,402
Total -	806,442	36,041	842,483

* Previous to this date the returns for Goole are associated with those of Hull.

	Tons.
Increase in 6 years coastwise -	24,931
(Do.) do. foreign -	1,127
Total do. increase	6,056
Increase per cent. -	21·12

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	154,283	2,827	157,110
1842	158,776	2,365	161,141
1843	175,735	1,498	177,233
1844	219,378	2,521	221,899
1845	172,714	6,451	179,165
1846	135,819	6,614	142,433
1847	144,723	2,322	147,045
1848	143,979	1,193	145,172
1849	119,823	2,078	121,901
1850	144,968	2,454	147,422
Total -	1,570,198	30,323	1,600,521

	Tons.
Decrease coastwise - -	9,215
(Do.) foreign - - -	373
Total decrease - - -	9,588
Decrease per cent. - - -	6·16

Grimsby Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1819	246	196	432
1820	—	100	110
1822	—	16	16
1823	45	—	45
1824	—	257	257
1825	—	—	—
1826	103	3	106
1827	—	—	—
1828	316	—	316
Total -	710	572	1,282
1835	—	—	—
1836	—	236	236
1837	—	111	111
1838	—	20	20
1839	83	419	502
1840	—	517	517
Total -	83	1,303	1,386

	Tons.
Increase foreign - - -	281
Total increase - - - -	281
Increase per cent. - -	119·06

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	402	231	633
1842	405	1,806	2,211
1843	744	1,735	2,479
1844	596	236	832
1845	174	148	322
1846	—	400	400
1847	—	428	428
1848	—	—	—
1849	—	745	745
1850	328	1,633	1,961
Total -	2,709	7,372	10,081

	Tons.
Decrease coastwise - -	134
Increase foreign - - -	1,412
Total increase - - -	1,278
Increase per cent. - - -	187·12

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APPENDIX No. 53.

SCOTCH COALFIELD.

GLASGOW SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	3,167	3,167*
1831	—	3,636	3,636†
1832	—	1,494	1,494
1833	79,531	5,247	84,778‡
1834	—	—	—
1835	77,913	7,469	85,382
1836	72,254	8,505	80,759
1837	66,128	3,178	69,306
1838	86,125	10,767	96,890
1839	101,038	20,733	121,771
1840	87,119	25,126	112,245
Total -	570,106	89,322	659,428

	Tons.
Increase in six years coastwise -	9,206
Do. do. foreign -	17,657
Total in six years increase - -	26,863
Increase per cent. - - -	31·46

* Including 39 tons of culm.
† Including 23 tons of culm.
‡ Including 25 tons of culm.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	75,238	28,783	104,021
1842	54,021	33,114	87,135
1843	59,185	26,681	85,866
1844	64,909	23,017	87,926
1845	66,975	29,376	96,351
1846	64,902	31,615	96,517
1847	56,665	29,470	86,135
1848	59,419	27,485	86,904
1849	78,654	42,421	121,075
1850	71,122	37,184	108,306
Total -	651,090	309,146	960,236

	Tons.
Decrease coastwise - - -	4,116
Increase foreign - - -	8,401
Total Increase - - - -	4,285
Increase per cent. - -	4·11

IRVINE SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	5,847	5,847
1831	—	6,147	6,147
1832	—	6,451	6,451
1833	116,844	5,770	122,614
1834	—	—	—
1835	147,049	3,078	150,127
1836	186,161	7,535	193,696
1837	187,522	10,505	198,027
1838	198,474	14,551	213,025
1839	248,417	19,224	267,641
1840	252,976	19,126	272,102
Total -	1,337,443	98,234	1,435,677

	Tons.
Increase coastwise - - -	105,927
Do. foreign - - -	16,048
Total increase - - - -	121,975
Increase per cent. - -	81·24

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	191,254	34,507	225,761
1842	185,833	41,592	227,425
1843	169,542	25,139	194,681
1844	185,390	46,415	231,795
1845	179,980	35,408	215,388
1846	177,635	14,382	192,017
1847	161,925	29,501	191,426
1848	221,803	48,398	270,201
1849	188,782	71,066	259,848
1850	191,420	72,667	264,087
Total -	1,853,554	419,070	2,272,624

	Tons.
Increase coastwise - - -	166
Do. foreign - - -	38,160
Total increase - - - -	38,326
Increase per cent. - -	16·97

AYR SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1833	46,422	259	46,681
1834	—	—	—
1835	53,432	589	54,021
1836	43,922	244	44,166
1837	53,137	—	53,137
1838	53,537	597	54,134
1839	73,457	151	73,608
1840	91,196	442	91,638
Total -	415,103	2,282	417,385

	Tons.
Increase coastwise - - -	37,764
Decrease foreign - - -	147
Total increase - - - -	37,617
Increase per cent. - -	69·63

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	81,973	3,385	85,358
1842	81,286	1,082	82,368
1843	71,015	874	71,889
1844	73,735	1,088	74,823
1845	81,521	371	81,892
1846	71,283	388	71,671
1847	61,689	603	62,292
1848	75,145	821	75,966
1849	73,089	896	73,985
1850	70,780	1,484	72,264
Total -	741,516	10,992	752,508

	Tons.
Decrease coastwise - -	11,193
Do. foreign - - -	1,901
Total decrease - - -	13,094
Decrease per cent. - -	15·34

GREENOCK SHIPMENTS.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	12,102	12,102
1831	—	14,754	14,754
1832	—	16,522	16,522
1833	611	15,263	15,874
1834	—	—	—
1835	535	13,998	14,533
1836	461	12,787	13,248
1837	956	14,857	15,813
1838	130	16,598	16,728
1839	1,389	16,011	17,400
1840	782	27,312	28,094
Total -	4,864	160,204	165,068

	Tons.
Increase coastwise - -	247
Do. foreign - - -	13,314
Total increase - - -	13,561
Increase per cent. - -	93·31

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	1,076	29,517	30,593
1842	209	23,168	23,377
1843	444	17,647	18,091
1844	307	17,818	18,125
1845	568	23,318	23,886
1846	217	16,808	17,025
1847	185	24,235	24,420
1848	461	23,564	24,025
1849	305	22,640	22,945
1850	623	20,759	21,382
Total -	4,895	219,474	224,369

	Tons.
Decrease coastwise - -	453
Do. foreign - - -	8,758
Total decrease - - -	9,211
Decrease per cent. - -	30·10

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Grangemouth Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	1,670	1,670
1831	—	1,983	1,983
1832	—	4,750	4,750
1833	65,570	4,658	70,228
1834	—	—	—
1835	76,675	5,109	81,784
1836	61,495	4,688	66,183
1837	54,576	6,204	60,780
1838	74,875	10,778	85,653
1839	69,383	11,151	80,534
1840	81,200	10,767	92,467
Total -	484,274	61,758	546,032

	Tons.
Increase coastwise - -	5,025
Do. foreign - - -	5,658
Total increase - - -	10,683
Increase per cent. - - -	31·60

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	6,495	263	6,758
1842	6,770	595	7,365
1843	8,677	2,109	10,786
1844	14,352	10,612	24,944
1845	4,979	11,794	16,968
1846	4,563	7,538	12,100
1847	3,738	7,532	11,270
1848	4,066	19,119	23,185
1849	4,333	19,065	23,398
1850	7,242	19,131	26,373
Total -	65,194	97,938	163,132

	Tons.
Increase coastwise - -	747
Do. foreign - - -	18,868
Total increase - - -	19,615
Increase per cent. - - -	290·24

Borrowstoness Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	15,344	15,344*
1831	—	23,180	23,180†
1832	—	21,372	21,372
1833	108,322	24,427‡	132,749
1834	—	—	—
1835	110,616	23,640	134,256
1836	107,332	22,868	130,200
1837	95,678	18,619	114,297
1838	115,301	23,131	138,432
1839	126,183	33,029	159,212
1840	130,608	29,339	160,947
Total -	794,040	244,949	1,038,989

* Including 138 tons of culm.
† Including 210 tons of culm.
‡ Including 320 tons of culm.

	Tons.
Increase in six years coastwise -	19,992
Do. do. foreign -	15,699
Total in six years increase - -	35,691
Increase per cent. - -	26·58

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	113,338	61,123	174,461
1842	104,200	64,693	168,893
1843	91,174	69,600	160,774
1844	118,696	93,265	211,961
1845	67,655	73,656	141,311
1846	59,944	64,907	124,851
1847	56,642	44,148	100,790
1848	55,912	57,821	113,733
1849	46,975	61,693	108,668
1850	46,985	70,006	116,991
Total -	761,523	660,912	1,422,435

	Tons.
Decrease coastwise - -	66,383
Increase foreign - - -	8,883
Decrease total - - -	57,470
Decrease per cent. - -	32·94

Kirkaldy Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	2,550	2,550
1831	—	6,560	6,560
1832	—	3,290	3,290
1833	37,751	5,310	43,061
1834	—	—	—
1835	47,049	4,557	51,606
1836	46,710	6,370	53,080
183	68,092	5,735	73,827
1838	60,720	8,871	69,591
1839	46,960	7,138	54,098
1840	52,262	10,875	63,137
Total -	420,800	61,256	420,800

	Tons.
Increase in 6 years coastwise -	5,213
Do. do. foreign -	6,318
Total do. increase -	11,531
Increase per cent. - -	22·34

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	57,159	15,749	72,908
1842	47,677	18,195	65,872
1843	39,937	17,232	57,169
1844	58,546	30,119	88,665
1845	45,105	20,779	65,884
1846	49,490	16,656	66,146
1847	45,144	17,823	62,967
1848	38,660	29,229	67,889
1849	36,459	41,038	77,497
1850	38,525	44,418	84,943
Total -	456,672	253,288	709,960

	Tons.
Decrease coastwise - -	18,634
Increase foreign - - -	30,669
Total increase - - -	12,035
Increase per cent. - -	16·50

Leith Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	2,872	2,872*
1831	—	5,507	5,507
1832	—	5,618	5,618
1833	19,547	7,827	27,374
1834	—	—	—
1835	43,774	7,511	51,285
1836	29,741	9,564	39,305
1837	21,427	9,287	30,714
1838	24,040	10,229	34,269
1839	30,459	18,366	48,825
1840	25,007	17,952	42,959
Total -	193,995	94,733	288,728

* 106 tons of culm included.

	Tons.
Decrease in 6 years coastwise -	18,767
Increase do. foreign -	10,441
Total do. decrease -	8,326
Decrease per cent. - -	16·23

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Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	18,178	20,794	38,972
1842	15,719	10,397	26,116
1843	11,912	9,927	21,839
1844	17,970	15,666	33,636
1845	8,831	9,721	18,552
1846	8,222	8,165	16,387
1847	5,492	6,478	11,970
1848	1,264	15,384	16,648
1849	1,249	20,911	22,160
1850	2,193	11,650	13,843
Total -	91,030	129,093	220,123

	Tons.
Decrease coastwise - -	15,965
Do. foreign - - -	9,144
Total decrease - - -	25,129
Decrease per cent. - -	64·47

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	—	4,535	4,535
1842	—	2,806	2,806
1843	—	2,723	2,723
1844	—	1,714	1,714
1845	—	1,686	1,686
1846	—	1,696	1,696
1847	—	823	823
1848	—	1,509	1,509
1849	—	9,762	9,762
1850	—	13,782	13,782
Total -	—	41,040	41,040

	Tons.
Increase foreign - - - -	9,247
Total increase - - -	9,247
Increase per cent. - -	205·90

Dundee Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1830	—	447	447
1831	—	723	723
1832	—	1,310	1,310
1833	27	852	879
1834	—	—	—
1835	—	765	765
1836	—	657	657
1837	—	469	469
1838	100	724	824
1839	244	814	1,058
1840	—	1,099	1,099
Total -	371	7,860	8,231

	Tons.
Increase in 6 years coastwise -	144
Do. do. foreign -	334
Total do. increase -	478
Increase per cent. - -	62·46

Alloa Shipments.

Years.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1841	80,974	12,235	93,209
1842	70,817	9,910	80,727
1843	86,606	14,921	101,527
1844	109,682	20,996	130,678
1845	74,695	25,306	100,001
1846	28,608	16,104	44,712
1847	39,668	12,366	52,034
1848	40,086	23,036	63,122
1849	40,091	32,411	72,502
1850	34,546	33,705	68,251
Total -	605,773	200,990	806,763

	Tons.
Decrease coastwise - -	46,428
Increase foreign - - -	21,470
Total decrease - - -	24,958
Decrease per cent. - -	26·77

Shipments from the smaller Ports of Scotland.

Years.	Port Glasgow.		Arbroath.		Aberdeen.		Montrose.		Perth.	
	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1835	—	4,535	—	—	—	20	—	100	—	—
1836	—	2,996	—	—	—	—	—	14	—	—
1837	14	9,938	—	—	—	60	—	—	—	—
1838	—	4,957	—	—	—	76	—	24	—	—
1839	18	3,768	—	—	—	120	—	20	—	—
1840	90	4,845	—	—	—	109	—	—	—	—
Total -	122	31,189	—	—	—	385	—	158	—	—

(*continued*)

Years.	Campbeltown.		Dumfries.		Stornoway.		Kirkwall.	Peterhead.	Lerwick.	Stranraer.	Wick.	Inverness.
	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1835	—	—	—	—	—	—	—	—	—	—	—	—
1836	—	—	—	4	—	—	—	—	—	—	—	—
1837	150	—	—	—	—	—	—	—	—	—	—	—
1838	575	—	—	—	—	—	—	—	—	—	—	—
1839	1,800	40	—	—	—	—	—	—	—	—	—	—
1840	1,794	—	—	—	—	—	—	—	—	100	—	—
Total -	4,319	40	—	4	—	—	—	—	—	100	—	—

Total Shipments.

	Tons.
1835 - - - - -	4,955
1836 - - - - -	3,014
1837 - - - - -	10,162
1838 - - - - -	5,633
1839 - - - - -	5,766
1840 - - - - -	6,738
Total -	36,267

	Tons.
Increase coastwise - -	1,720
Decrease foreign - -	181
Total increase - -	1,539
Increase per cent. -	31·05

(*continued*)

Years.	Port Glasgow.		Arbroath.		Aberdeen.		Montrose.		Perth.	
	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	460	4,104	—	—	—	240	—	74	—	—
1842	—	4,203	—	—	—	—	—	149	—	—
1843	—	4,077	—	—	36	—	40	—	—	—
1844	—	6,076	—	115	—	234	—	70	—	—
1845	—	6,225	—	17	—	—	—	—	—	—
1846	320	4,478	—	363	—	491	—	—	—	—
1847	180	6,418	—	107	—	165	—	—	—	—
1848	—	10,109	—	40	—	639	—	—	—	—
1849	—	8,527	—	—	—	209	—	—	—	—
1850	687	9,279	—	54	—	150	—	184	—	—
Total -	1,627	63,494	—	696	36	2,119	40	477	—	—

(*continued*)

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Years.	Campbeltown.		Dumfries.		Stornoway.		Kirkwall.	Peterhead.	Lerwick.	Stranraer.	Wick.	Inverness.
	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Coastwise.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.	Shipments Foreign.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1841	915	—	—	—	—	—	—	—	—	—	—	—
1842	504	—	—	23	—	—	—	—	—	30	—	—
1843	346	—	242	3	—	—	—	—	—	—	—	—
1844	121	—	156	—	52	—	—	—	—	—	—	—
1845	79	—	—	—	—	—	—	—	—	30	—	—
1846	—	—	—	—	—	—	—	—	—	—	—	—
1847	—	—	—	—	—	—	—	—	—	—	—	—
1848	—	—	—	—	—	—	—	—	—	—	—	—
1849	31	—	—	—	—	115	—	—	—	—	—	—
1850	—	—	—	—	—	—	—	—	—	—	—	—
Total -	1,996	—	398	26	52	115	—	—	—	60	—	—

Total Shipments.

	Tons.
1841 - - - -	5,793
1842 - - - -	4,909
1843 - - - -	4,744
1844 - - - -	6,824
1845 - - - -	6,349
1846 - - - -	5,652
1847 - - - -	6,850
1848 - - - -	10,788
1849 - - - -	8,978
1850 - - - -	10,354
Total - -	71,136

	Tons.
Decrease coastwise - -	763
Increase foreign - - -	5,134
Total increase - - -	4,371
Increase per cent. - - -	75·45

Appendix No. 54.

Account of Scotch and English Coals imported at Leith, Dundee, and Perth, from the Year 1801 to 1821 inclusive.

Years.	Leith.		Total Leith.	Dundee.		Total Dundee.	Perth.		Total Perth.	Grand Total.	Grand Total.
	Scotch.	English.	Both Kinds.	Scotch.	English.	Both Kinds.	Scotch.	English.	Both Kinds.	Scotch.	English.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1801 - - -	27,172	1,457	28,629	16,743	5,100	21,843	22,093	5,951	28,044	66,008	12,508
1802 - - -	27,632	1,285	28,917	16,634	6,230	22,914	25,091	8,759	33,850	69,357	16,334
1803 - - -	33,184	2,564	35,698	16,708	7,960	24,668	20,635	12,672	33,297	70,467	23,196
1804 - - -	36,420	3,370	39,790	14,124	8,740	22,864	25,045	13,793	38,838	85,589	25,903
1805 - - -	37,980	2,763	40,693	15,668	9,920	25,588	24,681	15,217	39,898	78,279	27,900
1806 - - -	40,984	2,319	43,303	13,810	9,900	23,710	24,089	15,806	39,845	78,853	28,025
1807 - - -	43,528	5,247	48,775	15,950	11,860	27,810	24,166	18,408	42,574	83,644	35,515
1808 - - -	54,832	7,974	62,806	13,680	13,620	27,300	23,770½	29,036	52,806½	92,282	50,603
1809 - - -	43,061	6,406	49,467	12,718	15,080	27,798	23,574	27,015	50,589	79,353	48,501
1810 - - -	43,779	8,287	52,066	11,830	13,840	25,670	23,377½	24,995	48,372½	78,986	47,112
1811 - - -	47,000	6,052	53,052	11,145	14,400	25,545	16,075	22,520	38,595	74,220	42,972
1812 - - -	49,885	9,750	59,635	10,050	17,800	27,850	18,794½	14,640	32,434½	78,729	42,190
1813 - - -	41,157	9,454	50,611	10,060	12,600	22,660	17,408	11,280	28,688	68,625	43,334
1814 - - -	38,261	7,597	45,858	14,760	15,220	29,980	22,205	15,047½	37,252½	75,226	37,864
1815 - - -	32,235	9,345	41,580	12,450	16,040	28,490	24,231	15,547½	39,778½	68,916	30,932
1816 - - -	37,101	10,918	48,019	11,017	22,222	33,239	23,158	15,615	38,773	71,276	48,755
1817 - - -	42,825	9,560	52,385	—	—	—	21,050	14,775	35,825	—	—
1818 - - -	42,423	11,139	53,562	—	—	—	19,291	16,506½	35,797½	—	—
1819 - - -	44,128	10,337	54,465	—	—	—	19,188	21,147	40,335	—	—
1820 - - -	40,072	12,561	52,633	—	—	—	18,282	18,438½	36,720½	—	—
1821 - - -	41,254	10,729½	51,983½	—	—	—	—	—	—	—	—

Appendix, Table No. 54a.

Forth Coals.

	s.	d.	s.	d.
Best great coal, *present advanced* prices, viz., St. David's - - -	17	6		
Average freight 2s. 6d. per ton, per chalder - - - - - -	6	9		
			24	3
Second great coal, present *advanced* prices - - - -	15	9		
Freight - - - - -	6	9		
			22	6
Best round or metable coal, present *advanced* prices, viz., St. David's -	15	6		
Freight - - - - -	6	9		
			22	3
Second round or metable coal, *advanced* prices - - - - -	13	6		
Freight - - - - -	6	9		
			20	3
Slack or small coal, best ditto for lime-burning, *advanced* prices - -	9	5½		
Freight - - - - - -	6	9		
			16	2½

Comparative Table of the Price of English and Scots Coal in the Firth of Forth and Tay.

—	Newcastle. In the Forth.	Forth. In the Forth.	Newcastle. In the Tay.	Forth. In the Tay.
	s. d.	s. d.	s. d.	s. d.
Best - -	35 6	24 3	35 6	28 3
Second -	33 6	22 6	33 6	26 6
Third -	32 6	22 3	32 6	26 3
Slack -	29 6	16 2½	29 6	18 2½

It has been likewise thought proper to give a table of the prices of English and Forth coals at Aberdeen, where the freights from the Forth, and from Newcastle and Sunderland may be supposed to be much about a par.

—	Newcastle. At Aberdeen.	Forth. At Aberdeen.
	s. d.	s. d.
Best - - -	35 6	31 0
Second - - -	33 6	29 3
Third - -	32 6	29 0
Slack - - -	29 6	22 11½

Newcastle.

	s.	d.		
Best - - - -	46	6		
Second - - - -	33	6		
Third - - - -	32	6		
Slack - - - -	29	6		

Culross.

	s.	d.		
Best - - - -	16	2½		
Freight - - -	6	9		
			22	11½
Second - - - -	15	0		
Freight - - - -	6	9		
			21	9
Third - - - -	13	6		
Freight - - - -	6	9		
			20	3
Slack - - - -	9	5½		
Freight - - -	6	9		
			16	2½

Newcastle and Culross coals, Forth of Tay:

	Newcastle. s.	d.	Culross. s.	d.
Best - - - -	35	6	26	11½
Second - - - -	33	6	25	9
Third - - - -	32	6	24	3
Slack - - - -	29	6	20	2½

Newcastle and Culross Coals delivered at Aberdeen, &c.

Best - - - -	35	6	29	8½
Second - - - -	33	6	28	6
Third - - - -	32	6	27	0
Slack - - - -	29	6	22	11½

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Appendix, Table No. 55.

Mr. Meadows' Report on the Coal of Manchester, November 1837.

The quantity of coals per annum now brought to Manchester are found to be nearly as follows, 1834 :—

	Tons.
From the Pendleton Road	163,098
„ Bolton Canal	115,428
„ Liverpool Railway	21,056
„ Ashton Canal	206,474
„ Rochdale Canal	58,968
„ Oldham Road	82,056
„ Hyde Road	1,560
„ Duke's Canal	71,136
„ Ditto from Wigan	11,232
From other sources about	6,000
Total	737,008

1836.	By Canal.	By Road.	Totals.
	Tons.	Tons.	Tons.
Bolton and Bury	120,522	—	120,522
Rochdale	55,388	9,100	64,488
Duke's to the Rochdale Canal	150,983	—	150,983
Ashton	200,400	—	200,400
Duke's Canal to Castlefield	43,305	—	43,305
Hyde	—	5,200	5,200
Pendleton	—	214,604	214,604
Liverpool Railway	—	27,105	27,105
Oldham	—	81,354	81,357
Bradford	—	6,000	6,000
Total	570,628	343,363	913,991

	Tons.
By Canals	570,628
By railways and turnpike roads	343,368
	913,991

Ashton Canal Office,
Manchester, 20 June 1837.

Dear Sir,

I was anxious to have ascertained the quantity of coal brought into Manchester by the different railways, canals, and roads in the year 1836. But in consequence of not having received the quantity from the agent of the Duke of Bridgewater's Canal, which they sell at Castle Field, I am unable to complete it. He has promised to let me have it, and if the document is of any use to the Statistical Society, I shall be glad to furnish it when completed. The following is the statement as it stands at present.

	Tons.*
By canals	527,323
Turnpike roads and Railway	343,363

I am, dear Sir,
Your obdt. Servant,
James Meadows.

Jno. Kennedy, Esq.

* This includes the quantity of coal which passes from the Bridgewater Canal to the Rochdale Canal.

Appendix, Table No. 56.

Table showing the Quantity of Coal imported into the different Ports of England and Wales, Scotland, and Ireland in the years 1827 and 1828, and the years 1867 and 1868.

—	1827.	1828.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.
London	1,779,819	1,848,008	3,016,416	2,981,230
Rochester	116,982	121,096	457,308	411,530
Faversham	34,085	34,450	135,362	132,835
Ramsgate	34,218	36,337	21,857	21,085
Deal	5,950	7,035	16,409	15,209
Dover	26,310	27,004	57,267	55,458
Folkestone	—	—	55,141	50,546
Rye	30,713	32,909	56,695	51,628
Newhaven	19,395	27,166	88,984	84,062
Shoreham	48,597	52,102	127,768	116,915
Littlehampton	—	—	58,403	55,059
Arundel	19,974	20,542	—	—
Chichester	19,676	22,706	—	—
Portsmouth	55,943	59,388	203,285	193,212
Southampton	60,367	68,432	256,300	225,900
Cowes	16,650	18,639	62,244	60,417
Poole	18,996	20,483	56,769	45,194
Weymouth	42,442	19,667	26,383	26,914
Bridport	—	—	4,515	5,241
Lyme	14,432	12,982	5,924	5,652
Exeter	70,269	70,528	60,583	53,758
Teignmouth	—	—	57,488	53,205
Dartmouth	36,695	36,182	45,910	43,940
Plymouth	86,292	83,667	270,260	242,275
Looe	5,961	6,563	—	—
Fowey	20,117	20,940	72,234	61,360
Falmouth	12,090	10,994	42,457	36,715
Gweek	4,283	2,522	—	—
Truro	27,343	29,012	90,776	75,661
Penzance	11,441	9,254	57,492	50,448
Scilly	686	471	2,176	1,677
St. Ives	61,525	65,108	—	—
Padstow	19,436	19,192	43,232	36,156
Bideford	16,830	17,297	32,507	29,657
Barnstaple	16,814	17,020	69,329	70,495
Ilfracombe	5,227	5,892	—	—
Minehead	10,642	9,627	—	—
Bridgewater	15,509	16,624	241,089	231,192
Bristol	11,654	2,101	249,765	240,616
Gloucester	1,376	1,425	13,092	18,688
Chepstow	161	298	8,603	8,766
Cardiff	2,283	2,183	—	—
Newport	4	82	—	—
Swansea	525	780	2,287	369
Llanelly	598	672	4,922	4,261
Milford	13,989	11,324	21,076	17,762
Cardigan	11,323	11,888	2,794	2,585
Aberystwith	7,462	7,799	17,828	14,098
Carnarvon	—	—	78,435	77,391
Beaumaris	78,918	87,797	50,673	38,552
Chester	187	295	—	—
Castletown	—	—	12,018	11,340
Ramsay	—	—	11,100	9,456
Liverpool	4	48	169,517	159,241
Lancaster	5,255	2,394	35,471	26,062
Whitehaven	52	74	—	—
Carlisle	17	57	—	—
Workington	—	—	605	1,296
Berwick	598	396	6,903	6,876
Newcastle	2	—	195	—
Sunderland	—	—	—	—
Stockton	1	5	1,362	2,437
Hartlepool	—	—	58	—
Whitby	10,105	9,472	15,982	16,818
Scarborough	15,743	15,594	18,663	20,069
Bridlington	6,177	6,367	—	—
Hull	102	169	7,036	4,811
Goole	—	12	—	—
Grimsby	—	21	3,050	3,349

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	1827.	1828.	1867.	1868.
	Tons.	Tons	Tons.	Tons.
Boston	32,900	32,406	30,772	23,065
Wisbeach	37,142	39,611	12,852	10,762
Lynn	177,188	202,855	96,656	83,280
Wells	12,851	14,267	22,390	21,900
Clay	14,787	16,683	—	—
Yarmouth	122,161	133,505	136,650	115,928
Lowestoft	—	—	79,642	93,689
Southwold	9,245	9,177	—	—
Aldborough	8,446	9,475	—	—
Woodbridge	14,802	14,312	19,636	13,190
Ipswich	45,586	48,551	65,803	62,905
Harwich	29,715	32,665	27,042	23,919
Colchester	31,659	33,815	43,571	42,800
Maldon	46,725	51,549	66,682	61,255
Leigh	11,513	13,278	—	—
Total of England and Wales	3,546,922	3,668,191	7,129,278	6,770,742
SCOTLAND.				
Leith	173,299	166,398	57,701	57,775
Borrowstoness	136	25	—	—
Granton	—	—	—	170
Grangemouth	3,752	4,342	4,029	3,151
Alloa	—	—	288	133
Kirkaldy	9,945	12,994	7,825	5,691
Dundee	93,121	99,892	204,723	193,906
Montrose	44,659	56,698	22,851	23,207
Arbroath			43,152	40,672
Aberdeen	78,178	82,258	210,392	195,372
Peterhead	—	—	20,692	21,515
Banff	24,695	23,675	31,371	27,217
Inverness	33,648	31,979	91,596	86,922
Thurso	3,307	4,442	—	—
Wick	—	—	19,834	15,367
Kirkwall	2,097	2,853	7,250	8,282
Lerwick	626	553	2,441	2,536
Stornoway	262	643	1,520	1,470
Greenock	13,166	11,812	7,115	12,928
Port Glasgow	125	293	—	270
Glasgow	999	972	3,677	2,206
Ardrossan	—	—	1,464	1,140
Irvine	403	122	—	—
Troon	—	—	265	183
Ayr	—	—	496	116
Campbeltown	5,209	6,609	23,738	22,672
Dumfries	25,550	30,896	11,477	11,488
Wigton	—	—	15,825	13,916
Stranraer	3,519	4,211	16,055	16,042
Total of Scotland	521,696	541,042	805,797	764,341
IRELAND.				
Dublin	265,508	285,226	797,464	659,006
Wexford	27,992	28,546	47,069	37,087
Waterford	57,764	64,173	147,706	117,428
New Ross	—	—	27,251	25,964
Cork	129,741	138,191	296,371	253,736
Youghal	—	—	32,716	24,998
Skibbereen	—	—	15,388	10,023
Limerick	13,062	18,715	59,100	39,340
Tralee	—	—	7,013	6,663
Galway	3,729	2,874	14,113	10,782
Westport	2,028	1,860	2,926	2,226
Sligo	6,927	7,805	16,546	11,676
Ballina	—	—	3,003	1,622
Londonderry	8,378	16,292	96,328	80,465
Coleraine	1,951	2,254	23,995	20,090
Belfast	102,974	129,826	739,181	694,927
Newry	33,813	41,570	146,855	111,476
Dundalk	16,204	17,186	88,234	67,235
Drogheda	26,046	26,609	57,324	42,166
Baltimore	1,551	1,446	—	—
Total of Ireland	697,641	777,575	2,622,650	2,216,899
Total of the United Kingdom	4,766,259	4,986,808	9,557,733	9,751,982

COUNTIES in ENGLAND and WALES into which COALS have been brought coastwise during the year 1869.

Names of Counties.	Coal and Cinders.		Culm.	Total.
	Weight.	Measure.		
	Tons.	Chds.	Chds.	
London	265	1,548,170	3,797	
Kent	2,359	173,555	436	
Sussex	3,072	118,228	3,441	
Hampshire	2,436	124,404	119	
Dorsetshire	676	43,945	3,931	
Devonshire	61,388	96,408	63,323	
Cornwall	47,714	76,395	10,365	
Somersetshire	—	3,559	17,413	
Gloucester	1,797	638	7	
Monmouth	46	22	224	
Glamorgan	440	—	1,463	
Caermarthen	103	—	212	
Pembroke	7,016	—	242	
Cardigan	9,276	10	13,906	
Isle of Anglesea	70,668	56	9,396	
Cheshire	263	—	—	
Lancashire	56	555	—	
Cumberland	73	18	—	
Berwick	—	146	—	
Durham	—	118	—	
Yorkshire	20	25,412	—	
Lincoln	—	23,985	—	
Cambridge	—	29,030	—	
Norfolk	2,010	277,206	—	
Suffolk	50	62,876	—	
Essex	590	102,544	—	
Total	210,315	2,706,838	132,302	

Accounts and Papers, xxvii., 1830, p. 181.

The above may be compared with the following return made ten years later:—

Coals, cinder, and culm shipped coastwise from the following ports in 1839, and also from all other ports of the United Kingdom:—*

	Tons.
Newcastle	2,159,321
Stockton	1,308,778
Sunderland	913,960
Swansea	486,792
Newport	470,820
Whitehaven	439,188
All other ports of the United Kingdom	1,444,154
Total	7,223,013

* Statistics and Calculation by Samuel Salt, 1845.

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APPENDIX No. 57 a.

COALS IMPORTED into IRELAND in each of the following years:—

Years.	England.	Scotland.	Year ending 10th October.	Year ending 5th January. Total.
	Tons.	Tons.	Tons.	Tons.
1816	509,176	153,534	—	662,710
1817	542,045	170,943	—	712,988
1818	—	—	—	633,376
1819	—	—	—	668,884
1820	—	—	—	658,944
1821	—	—	—	651,909
1822	—	—	—	—
1823	—	—	—	—
1824	—	—	776,452	728,066
1825	—	—	693,401	695,028
1826	—	—	822,262	—
1827*	—	—	—	697,575
1828†	—	—	—	777,575
1829	—	—	—	—
1830	From South Wales only.		—	249,316
1831	Do.	Do.	—	245,406
1846	—	—	—	1,271,433
1847	—	—	—	969,558

* Vol. xix., 1828, p. 265.

† Of this quantity, the city of Dublin imported as follows, from the ports named:—

Whitehaven	- -	186,000 Imperial chaldrons.
Newcastle	- -	16,328 Newcastle chaldrons.
Liverpool	- -	44,856 Tons.
Lancaster	- -	13,250 Tons.
Scotland	- -	105,933 Chaldrons.
Wales	- -	142,763 Tons.
		20,000 Tons, culm.

Ports of Ireland receiving same.	Quantities. Tons.	cwts.
Dublin	265,507	10
Baltimore	1,551	10
Belfast	102,973	10
Coleraine	1,931	10
Cork	129.741	0
Drogheda	26,046	0
Dundalk	16,203	10
Galway	3,680	10
Limerick	13,038	10
Londonderry	8,378	0
Newry	33,813	10
Sligo	6,926	10
Waterford	57,763	10
Westport	2,028	10
Wexford	27,992	0
Total	697,575	10

APPENDIX 57 b.

A STATEMENT of the SEABORNE COAL TRADE from PADDINGTON and BRENTFORD, short of and to and beyond Lady Capel's*

Years.	Total Quantity in the Year.	From Paddington. Short of Lady Capel's.	From Paddington. To and beyond Lady Capel's.	From Brentford. Short of Lady Capel's.	From Brentford. To and beyond Lady Capel's.	Total from Paddington.	Total from Brentford.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1829	31,993	69¼	384	27,901½	3,638	453¼	31,539½
1830	33,937½	2½	167	29,508	4,259½	169½	33,767
1831	35,149½	2½	306½	28,668	4,172½	309	32,840½
1832	31,964½	105½	776½	27,940	3,142	882½	31,082
1833	36,788½	39½	2,954½	29,780½	4,013½	2,994½	33,794
1834	35,447½	710½	6,169½	25,525	3,042½	6,880½	28,567½
1835	41,303	479½	8,134½	29,393½	2,795	8,614½	32,688½
1836	45,930½	885½	9,551½	32,490½	3,003	10,437	35,493½
1837	47,938½	788½	9,669½	35,008½	2,472½	10,457½	37,481
Total -	338,451½	—	—	—	—	41,197½	297,254
							41,197½
						Total -	338,451½

* Extract from Report from Select Committee on the Coal Trade (port of London) Bill, June 15th, 1838, page 139.

APPENDIX, TABLE No. 58.

ACCOUNT of the COAL shipped from the several PORTS of GREAT BRITAIN in each of the following years, and sent coastwise to other Ports.

Years.	To London. Tons. cwts.	To London. *Chds. bsh.	To other Ports. Tons. cwts.	To other Ports. *Chds. bsh.	Total Coastwise. Tons. cwts.	Total Coastwise. *Chds. bsh.	Total Coastwise in Tons.	Total Foreign in Tons.	Total Shipments in Tons.
1816	9,129 12	1,145,529 18	305,877 4	1,212,405 23	315,006 16	2,357,935 5	3,321,373	824,536	4,145,909
1817	11,820 0	1,081,497 18	318,901 19	1,164,153 23	330,721 19	2,245,651 5	3,193,927	873,795	4,067,722
1818	—	—	—	—	330,286 9	2,432,503 4†	3,451,729	821,278	4,253,007

* Winchester measure. † This appears to include London and other ports.

QUANTITIES EXPORTED to IRELAND and FOREIGN COUNTRIES in same period.

Years.	To Ireland. Tons. cwts.	To Ireland. *Chds. bsh.	To other Countries. Tons. cwts.	To other Countries. Chds. bsh.	Total exported. Tons. cwts.	Total exported. Chds. bsh.	Total exported in Tons only. Tons. cwts.
1816	116,127 8	375,376 33	16,552 15	†62,698 1 *36,942 22	132,680 3	†62,698 1 *412,329 19	824,536 8
1817	148,163 4	375,291 28	23,713 17	†67,544 3 *34,855 12	171,877 1	†67,544 3 *410,147 4	873,806 1
1818	146,844 13	328,335 32	24,160 0	†73,701 4 *36,011 30	167,804 13	†73,701 4 *359,347 26	821,339 14

* Winchester measure. † Newcastle measure.

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Appendix No. 59.

STATEMENT of the QUANTITY of COAL shipped COASTWISE from PORTS of GREAT BRITAIN to other PORTS of GREAT BRITAIN, to IRELAND, to the BRITISH COLONIES, and to FOREIGN COUNTRIES in each year from 1819 to 1835.*

Years.	To Ports in Great Britain.	To Ireland.	To British Colonies.	To Foreign Countries.	To all Ports.
	Tons.	Tons.	Tons.	Tons.	Tons.
1819	3,489,508	662,660	71,497	164,375	4,365,040
1820	3,947,908	606,400	90,447	158,672	4,803,427
1821	3,731,906	644,787	90,423	170,941	4,638,059
1822	3,810,239	694,024	111,822	172,754	4,788,839
1823	4,372,839	693,413	89,713	163,662	5,319,627
1824	4,308,571	691,429	99,575	179,617	5,279,192
1825	4,384,433	695,832	114,264	197,234	5,391,763
1826	4,730,307	779,584	123,437	223,219	5,856,547
1827	4,440,318	650,728	123,109	244,232	5,458,377
1828	4,507,935	740,071	128,092	227,709	5,603,807
1829	5,014,132	840,246	128,893	240,854	6,224,125
1830	—	—	145,204	357,288	†
1831	—	—	152,278	356,419	†
1832	—	—	173,508	414,938	†
1833	5,859,179	‡	192,082	442,366	6,493,627
1834	5,822,561	‡	189,838	425,417	6,437,816
1835	6,117,993	‡	189,722	546,338	6,854,053

* Statistics and Calculations, by Samuel Salt, 1845.
† In consequence of the repeal of the coasting duty on coals, the Custom House has ceased to keep any record of the shipments, and no return of the quantities in these years has been called to Parliament.
‡ Including shipments to Ireland.

COALS and CULM EXPORTED from GREAT BRITAIN in the year ending 5 January 1820.

FOREIGN.

Coals.

Years.	Weight.	Newcastle Measure.	Winchester Measure.	Total in Tons.
1819.	Tons. cwts.	Chds. bsh.	Chds. bsh.	
Coals	175,949 14	25,978 12	391,054 4	—
Small coals	—	36,157 53	502 0	—
Total	175,949 14	62,135 65	391,556 4	838,890

Culm in 1819 and 1820.

	Chds. bsh.	Chds. bsh.	
Culm in 1819	182 42	15,167 27	19,778
Culm in 1820	325 10	11,005 0	14,717

COALS EXPORTED from GREAT BRITAIN in the year ending 5 January 1821.

Years.	Weight.	Newcastle Measure.	Winchester Measure.	Total in Tons.
1820.	Tons. cwts.	Chds. bsh.	Chds. bsh.	
Coals	135,879 7	28,561 56	380,738 21	—
Small coals	—	37,156 60	546 0	—
Total	135,879 7	65,718 44	381,284 21	796,012

AN ACCOUNT of all COALS EXPORTED from GREAT BRITAIN, COASTWISE and FOREIGN, in the year ending 5 January 1825.

	Quantity entered by Measure.		Quantity entered by Weight.	Total estimated Weight.
	Newcastle Measure.	Winchester Measure.		
To foreign parts	Chds. 71,116½	Chds. 48,821½	Tons. 25,161½	Tons. 278,695
To Ireland	—	380,774½	162,878½	691,430
Coastwise	1,180,805	402,670	426,499½	4,114,877
Total	1,251,921½	831,765½	612,539½	5,084,762

Accounts and Papers, vol. XX., 1825.

Appendix, Table No. 60.

TOTAL SHIPMENTS of Coal to our COLONIAL POSSESSIONS and FOREIGN COUNTRIES since 1816.

Date.	To British Colonies.	To Foreign Countries.	Total Exports.	Duties on Seaborne Coal.
	Tons.	Tons.	Tons.	
1816		237,657	237,657	Paid in London 7s. 6d. per ton.
1817		253,141	253,141	" "
1818		272,456	272,456	" "
	Tons.	Tons.		
1819	71,497	164,375	235,872	" "
1820	90,447	158,672	249,119	" "
1821	90,423	170,941	261,364	" "
1822	111,822	172,754	284,576	" "
1823	89,713	163,662	253,375	" "
1824	99,575	179,617	279,192	Paid in London 4s. per ton.
1825	114,264	197,234	311,498	" "
1826	123,437	233,219	356,656	" "
1827	123,109	244,232	367,331	" "
1828	128,092	227,709	355,801	" "
1829	128,893	240,854	369,847	" "
1830	145,204	357,288	502,492	5s. 9d. per ton in British ships. 10s. per ton in foreign ships.
1831	152,278	356,419	508,697	3s. 4d. per ton in British ships. 12s. 2d. per ton in foreign ships.
1832	173,508	414,938	588,446	"
1833	192,082	442,366	634,448	3s. 4d. per ton in British ships. 6s. 8d. per ton in foreign ships.
1834	189,838	425,417	615,255	" "

Date.	Coals.	Cinders, *Coke.*	Culm, *Anthracite.*	Total Exports.	Duties on Seaborne Coal.
	Tons.	Tons.	Tons.	Tons.	
1835	729,478	3,964	2,618	736,060	British possessions. *Free.* Foreign countries 10 per cent. *ad valorem.*
1836	910,773	5,191	904	916,868	" "
1837	1,106,020	6,447	1,143	1,113,610	" "
1838	1,303,384	9,692	632	1,313,709	" "
1839	1,431,861	17,163	393	1,449,417	" "
1840	1,592,283	13,783	247	1,606,313	" "
1841	1,831,554	16,514	226	1,848,294	" "
1842	1,975,260	23,434	790	1,999,504	Large coal 2s. per ton. Small coal 1s. per ton.
1843	1,830,284	42,696	3,229	1,866,211	" "
1844	1,698,391	49,389	6,391	1,754,171	" "
1845	2,442,740	84,556	3,986	2,531,282	British ships, *free.* *Foreign ships without privileges* 4s. per ton.
1846	2,482,382	95,554	3,173	2,581,108	" "
1847	2,390,087	88,884	4,190	2,483,161	" "
1848	2,699,468	82,908	2,924	2,785,300	" "
1849	2,730,567	95,630	1,842	2,828,039	" "
1850	3,211,619	137,848	2,913	3,351,380	The duties on coals, &c., wholly repealed from 14th August 1850.

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Appendix No. 61.

The Number of Collieries in the United Kingdom in each Year since 1854, from Lists compiled and corrected by Her Majesty's Inspectors of Collieries.

ENGLAND.

——	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Northumberland, Durham	265	272	270	268	275	283	270	271	279	230	289	292	297	307	307	307
Cumberland - - -	23	23	28	28	28	28	28	28	28	32	30	30	30	25	27	26
Yorkshire - - -	276	333	340	374	383	383	397	397	418	418	422	434	447	455	441	413
Derbyshire - - -	123	171	176	173	161	151	153	158	155	153	154	154	150	152	142	14
Nottinghamshire - -	17	20	24	23	23	23	21	22	21	20	21	21	25	25	27	26
Warwickshire - -	15	17	16	16	17	17	17	16	16	17	16	16	15	15	16	16
Leicestershire - -	11	11	14	14	14	14	14	11	10	10	10	11	11	11	10	10
Staffordshire N. and S. and Worcestershire.	516	600	557	573	548	549	568	580	571	582	640	667	619	689	617*	488
Lancashire - - -	333	367	359	359	380	381	371	373	381	379	379*	342*	346	353	386	392
Cheshire - - -	30	32	31	31	35	35	35	39	39	39	39	39	39	39	29	28
Shropshire - - -	48	56	55	53	57	59	68	66	65	66	66	69	63	62	64	59
Monmouthshire - -	60	63	65	69	73	74	79	90	86	90	85	83	78	73	92	73
Gloucestershire - -	54	55	56	62	59	60	63	71	76	78*	94*	97*	79	76	73	64
Somersetshire - -	31	31	29	35	35	35	37	40	42	41	37	37	35	34	36	34
Devonshire - - -	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Total - -	1,824	2,045	2,031	2,082	2,090	2,094	2,113	2,164	2,189	2,207	2,284	2,293	2,235	2,316	2,091	2,027

Note.—The returns of the earlier years have been corrected since the numbers were first published.
* The differences in the numbers of the collieries in those years arises from including some pits belonging to collieries as independent collieries in one year and not so in another.

WALES.

——	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Pembrokeshire - -	19	18	17	18	17	20	20	21	21	21	20	20	20	19	17	16
Carmarthenshire - -	42	47	57	67	87	87	86	88	87	92	80	80	80	78	67	60
Glamorganshire - -	138	147	165	171	175	181	193	204	222	233	233	232	254	252	214	239
Flintshire - - -	30	31	42	40	38	37	40	38	41	41	41	43	40	37	34	32
Denbighshire - -	25	29	34	39	38	39	39	35	31	35	35	36	35	34	29	31
Anglesea - - -	5	5	5	5	5	5	5	5	5	5	5	5	5	4	3	2
Total - -	259	277	320	340	360	369	383	391	407	427	414	406	434	424	364	380

IRELAND.

Ulster Coalfield, in the counties Antrim, Tyrone, and Cowan, about seven collieries, occasionally worked on a small scale.
Connaught Coalfield, in the counties Leitrim, Sligo, and Roscommon, seven collieries, at present all working.
Leinster Coalfield, in the counties Kilkenny, Carlow, Queen's County, 31 collieries, not more than one-third of them at work.
Munster Coalfield, in the counties Tipperary, Cork, 26 collieries, about 16 at work.
The collieries in Ireland have been worked so irregularly that it is not possible to obtain any reliable return of them, except for the last few years.

SCOTLAND.

——	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
Lanarkshire - -	153	157	159	168	167	164	171	169	184	196	202	208	216	213	189	176
Ayrshire - - -	78	93	93	100	94	91	91	90	91	96	101	100	97	94	27	87
Stirlingshire - -	34	35	35	36	36	36	39	39	41	46	48	49	47	48	41	40
Dumbartonshire - -	11	11	11	11	12	12	12	14	13	16	17	17	16	14	12	12
Renfrewshire - -	7	11	11	12	10	9	9	8	9	11	11	11	10	10	12	11
Argyleshire - - -	—	—	—	—	—	—	1	1	1	1	1	1	1	1	1	1
Dumfriesshire - -	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Fifeshire - - -	34	42	40	40	41	41	44	44	46	48	49	49	45	43	36	35
Clackmannanshire -	8	10	10	9	9	9	9	9	8	8	8	8	5	5	5	5
Haddingtonshire - -	11	11	11	11	11	12	12	12	13	14	14	14	13	13	13	10
Edinburghshire - -	11	13	14	13	14	15	16	15	17	16	16	16	15	16	13	14
Linlithgowshire - -	15	15	15	18	17	18	17	17	17	20	20	20	16	16	15	12
Peebleshire - -	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1
Perthshire - - -	1	1	1	2	1	1	1	1	2	3	3	3	3	3	3	3
Kinross-shire - -	—	—	—	—	—	—	—	—	1	2	2	2	1	1	—	1
Total - -	368	403	405	425	417	413	427	426	448	482	497	497	491	483	433	412

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Appendix, Table No. 62.

The Production of Coal from all the Collieries of the United Kingdom since the Year 1854.

—	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
Durham and Northumberland	15,420,615	15,431,400	15,492,969	15,826,525	15,853,484	16,001,125	18,244,708	19,144,965	19,360,356	22,154,146	23,248,367	25,032,694	25,194,550	24,867,474	24,594,167	25,765,430	The Returns for 1870 not being completed when this table was printed, will be given separately.
Cumberland	887,000	809,549	998,891	942,018	920,137	1,041,890	1,171,052	1,255,644	1,330,287	1,327,868	1,380,795	1,431,047	1,490,461	1,512,514	1,378,026	1,410,808	
Yorkshire	7,260,500	7,747,470	9,063,625	8,875,440	8,302,150	8,357,100	9,284,000	9,374,600	9,255,500	9,402,500	8,809,600	9,355,100	9,714,700	9,843,575	9,740,510	10,829,827	
Derbyshire	2,406,696	2,256,000	3,296,325	3,687,442	4,012,250	4,351,000	4,940,000	5,116,319	4,534,800	4,550,750	4,470,750	4,595,750	4,750,520	4,550,550	4,957,379	5,460,090	
Nottinghamshire	813,474	809,400							732,666	750,000	796,700	1,095,500	1,600,560	1,575,000	1,508,439	1,575,450	
Leicestershire	439,000	425,000	632,478	698,750	698,500	699,000	730,000	740,000	696,024	805,750	800,500	965,500	866,560	1,150,000	608,088	650,700	
Warwickshire	255,000	262,000	335,000	398,000	356,540	355,750	545,000	647,000	678,000	685,500	754,000	859,000	775,000	880,850	624,859	585,630	
Staffordshire and Worcestershire	7,500,000	7,323 000	7,305,500	7,164,625	6,680,780	6,125,000	7,648,30	7,253,750	7,522,750	7,879,320	11,459,851	12,200,989	12,298,580	12,526,554	13,294,780	12,669,107	
Lancashire	9,080,500	8,950,000	8,950,000	8,565,500	8,050,000	10,650,000	11,350,000	12,195,500	10,597,500	10,875,500	11,530,000	11,962,000	12,320,500	12,841,500	12,800,500	13,995,500	
Cheshire	786,500	755,500	754,327	780,500	695,450	700,500	750,500	801,576	787,750	822,750	822,750	850,000	895,500	935,000	937,500	957,150	
Shropshire	1,080,000	1,105,250	752,100	750,000	749,360	765,750	856,500	829,750	1,029,750	1,150,000	1,150,000	1,135,000	1,220,700	1,558,500	1,495,500	1,392,862	
Gloucestershire, Somersetshire, and Devonshire	1,492,366	1,430,620	1,530,000	1,225,000	1,125,250	1,250,000	5,503,400*	6,511,025*	1,750,000	1,950,000	1,950,000	1,875,000	1,850,700	1,975,000	1,969,000	1,979,950	
Monmouthshire	8,500,000	8,552,270	8,919,100	7,132,304	7,495,289	9,600,350			3,750,000	4,075,000	4,028,500	4,125,000	4,445,000	4,569,500	4,250,500	4,275,150	
South Wales							6,254,813	6,690,771	6,749,455	6,917,081	6,948,000	7,911,507	9,376,443	9,092,300	8,959,500	9,179,650	
North Wales	1,430,000	1,125,000	1,046,500	1,046,500	1,022,500	1,662,000	1,750,500	1,870,250	1,660,000	1,728,000	1,987,060	1,983,000	2,082,000	2,371,250	2,385,000	2,155,180	
Scotland	7,448,099	7,325,000	7,500,000	8,211,473	8,926,249	10,300,000	10,900,500	11,081,000	11,076,000	11,100,500	12,400,000	12,650,000	12,625,000	14,125,943	14,709,959	14,417,150	
Ireland	148,750	145,620	136,635	120,630	120,750	120,300	119,425	123,070	127,500	127,050	125,000	123,500	123,750	125,000	126,950	127,923	
Total of United Kingdom	64,661,401	64,453,070	66,645,450	65,394,707	65,008,649	71,979,765	84,042,698	86,039,214	81,638,338	86,292,215	92,787,873	98,150,587	101,630,544	104,500,480	103,141,157	107,427,557	
Increase	—	—	2,192,371	—	—	6,971,116	6,062,933	1,996,516	—	4,653,877	6,495,658	5,362,714	3,479,957	2,869,936	—	4,286,400	—
Decrease	—	208,332	—	1,250,743	386,058	—	—	—	4,400,876	—	—	—	—	—	1,359,333	—	—

* In 1860 and 1861 Monmouthshire and Gloucestershire and Somersetshire were given together as the South-western District.

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Shipments of Coal from Ports of the TYNE, WEAR, and TEES since 1850.

Appendix, Table No. 63.

Shipments of Coal from NEWCASTLE.

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1851	2,007,112	1,092,769	3,159,881
1852	2,175,857	1,141,181	3,317,038
1853	2,144,288	1,111,870	3,256,158
1854	2,148,076	1,419,521	3,567,597
1855	2,022,359	1,520,424	3,542,783
1856	1,949,670	1,759,321	3,708,991
1857	2,091,372	1,914,665	4,006,037
1858	2,076,350	1,863,718	3,940,568
1859	2,088,006	2,026,906	4,114,912
1860	2,816,471	2,031,445	4,247,916
Total	20,980,061	15,881,820	36,861,881

Tons.
Increase, coastwise 142,359.
Increase, foreign 238,676.
Increase, total 1,088,035, or 34·43 per cent.

Shipments of Coal from NEWCASTLE.

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	2,275,989	2,095,670	4,371,659
1862	2,134,039	2,105,295	4,239,334
1863	2,150,675	2,058,897	4,209,572
1864	2,302,269	2,334,610	4,636,879
1865	2,531,015	2,434,442	4,965,457
1866	2,529,551	2,560,947	5,090,498
1867	2,537,013	2,697,553	5,234,566
1868	2,432,381	2,565,035	4,997,416
1869	2,327,733	2,674,405	5,002,138
1870	—	—	—
Total for 9 years	21,220,665	21,526,354	42,747,519

Tons.
Increase, coastwise 51,744.
Increase, foreign 578,735.
Increase, total 630,479, or 14·42 per cent.

Appendix, Table No. 64.

Shipments of Coal from SUNDERLAND.

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1851	1,899,160	472,417	2,371,577
1852	1,978,611	510,699	2,489,310
1853	1,914,570	542,227	2,456,797
1854	2,068,445	505,448	2,573,893
1855	1,942,861	570,328	2,513,189
1856	2,009,847	797,763	2,807,610
1857	2,149,190	1,037,222	3,186,412
1858	2,197,285	990,676	3,187,961
1859	2,237,731	926,183	3,163,914
1860	2,445,428	1,027,093	3,472,521
Total	20,843,128	7,380,056	28,223,184

Tons.
Increase, coastwise 546,263.
Increase, foreign 554,676.
Increase, total 1,100,944, or 46·42 per cent.

Shipments of Coal from SUNDERLAND.

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	2,339,274	1,120,849	3,460,123
1862	2,469,100	1,165,996	3,636,096
1863	2,458,211	1,118,274	3,576,485
1864	2,379,064	1,077,046	3,456,107
1865	2,239,988	1,186,061	3,426,049
1866	2,229,263	1,145,570	3,374,833
1867	2,314,231	1,187,869	3,502,100
1868	2,443,276	1,234,462	3,677,738
1869	2,118,125	1,209,806	3,327,931
1870	—	—	—
Total for 9 years	20,981,532	10,445,930	31,427,462

Tons.
Decrease, coastwise 221,149.
Increase, foreign 88,957.
Decrease, total 142,192 or 4·27 per cent.

Appendix, Table No. 65.

Shipments from HARTLEPOOL.*

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1851	1,137,999	350,509	1,488,498
1852	1,340,876	391,538	1,732,414
1853	1,278,417	443,291	1,721,708
1854	1,268,583	409,780	1,678,363
1855	1,138,749	469,080	1,607,829
1856	1,110,232	526,851	1,637,083
1857	1,153,562	520,583	1,674,145
1858	1,212,961	530,852	1,743,813
1859	1,530,999	549,478	2,130,477
1860	1,522,105	379,318	1,901,423
Total	13,544,483	4,771,280	17,315,773

Tons.
Increase, coastwise 184,116.
Increase, foreign 228,809.
Increase, total 412,925, or 27·74 per cent.

* 1845 is the earliest date for which returns are published for Hartlepool.

Shipments of Coal from HARTLEPOOL.

Years.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	1,408,966	624,281	2,033,247
1862	1,307,260	618,183	1,925,443
1863	1,232,217	595,292	1,827,509
1864	1,162,956	549,783	1,712,739
1865	993,880	570,802	1,564,682
1866	903,834	604,962	1,508,796
1867	895,470	670,813	1,566,283
1868	858,631	689,046	1,547,677
1869	835,499	618,425	1,453,924
1870	—	—	—
Total for 9 years	9,598,713	5,541,587	15,140,300

Tons.
Decrease, coastwise, 578,467.
Increase, foreign, 5,856.
Decrease, total, 572,523 or 32·96 per cent.

Appendix, Table No. 66.

Shipments from STOCKTON-ON-TEES.*

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1851	388,646	88,808	477,454
1852	336,821	74,936	411,757
1853	289,135	89,334	378,469
1854	212,526	86,312	298,838
1855	142,205	92,505	234,710
1856	153,341	106,937	260,278
1857	158,367	117,390	275,757
1858	191,344	112,915	304,259
1859	197,526	103,606	301,132
1860†	217,712	120,941	338,653
Total	2,287,623	993,684	3,281,307

Tons.
Decrease, coastwise 170,964.
Increase, foreign 32,133.
Decrease, total 138,801, or 29·0 per cent.

* In 1844 and previous years, the shipments from Hartlepool are included in those of Stockton; in subsequent years they are separated.
† In 1860 and previous years the shipments from Middlesborough are included in Stockton; in subsequent years they are separated.

Shipments of Coal from STOCKTON-ON-TEES.

Years.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	3,108	1,507	4,615
1862	846	3,469	4,315
1863	560	2,079	2,639
1864	707	758	1,465
1865	682	50	732
1866	69	127	196
1867	255	185	440
1868	180	1,283	1,463
1869	1,016	788	1,804
1870	—	—	—
Total for 9 years	7,423	10,24	17,669

Tons.
Decrease, coastwise, 2,092.
Decrease, foreign, 719.
Decrease, total 2,811 or 15·58 per cent.

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Appendix, Table No. 67.

Shipments from NORTH SHIELDS.*

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1851	214,839	175,567	390,396
1852	168,172	216,192	380,364
1853	213,966	242,031	454,997
1854	225,763	194,203	419,966
1855	164,391	170,519	334,910
1856	226,889	183,638	410,527
1857	112,024	275,933	387,957
1858	130,274	245,361	375,636
1859	123,258	250,345	373,603
1860	125,067	237,976	363,043
Total	1,703,633	2,191,966	3,895,599

Tons.
Decrease, coastwise 89,762.
Increase, foreign 62,409.
Decrease, total 27,353, or 7 per cent.

* 1846 is the earliest date for which returns are published for North Shields.

Shipments of Coal from NORTH SHIELDS.

Years.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	170,147	209,536	379,683
1862	147,529	233,433	380,962
1863	135,787	235,081	370,868
1864	153,053	255,775	408,828
1865	81,503	301,031	382,534
1866	23,736	296,170	320,906
1867	119,198	333,259	452,452
1868	96,225	305,107	401,342
1869	119,570	325,178	444,748
1870	—	—	—
Total for 9 years	1,045,553	2,496,370	3,541,923

Tons.
Decrease, coastwise, 50,777.
Increase, foreign, 115,742.
Increase, total, 65,065 or 17·14 per cent.

Appendix, Table No. 68.

Shipments of Coal from MIDDLESBOROUGH.

Years.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861	202,444	142,392	344,836
1862	175,504	135,372	310,876
1863	178,493	128,116	306,609
1864	212,933	110,696	323,629
1865	193,935	145,373	339,308
1866	151,772	123,395	275,167
1867	138,309	107,142	245,451
1868	93,005	81,883	174,888
1869	76,196	67,663	143,859
Total for 9 years	1,422,653	1,042,051	2,464,634

Tons.
Decrease, coastwise, 126,346.
Decrease, foreign 74,728.
Decrease, total, 200,976 or 139·70 per cent.

1861 is the earliest date for which returns are published for Middlesborough.

Appendix, Table No. 69.

Shipments of Coal from SOUTH SHIELDS.

Years.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1866*	39,374	64,067	103,441
1867	22,367	116,881	139,248
1868	5,842	118,790	124,632
1869	17,286	139,995	157,281
1870	—	—	—
Total for 4 years	84,869	439,733	524,602

Tons.
Decrease, coastwise, 22,088.
Increase, foreign, 75,928.
Increase, total, 53,840 or 33·4 per cent.

* 1866.—This is the earliest return of coal shipped from South Shields; in previous years it was included in North Shields.

Appendix, Table No. 70.

Shipments from the Northern Ports in Decennial Periods since 1800.

Years.	Newcastle. Total Shipments for Ten Years.	Sunderland. Total Shipments for Ten Years.	Stockton. Total Shipments for Ten Years.	Hartlepool. Total Shipments for Ten Years.	North Shields. Total Shipments for Ten Years.	Middlesborough. Total Shipments for Ten Years.	South Shields. Total Shipments for Ten Years.	Total Shipments.	Increase over the previous Ten Years.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
From 1801 to 1810	15,468,784	8,370,644	—	—	—	—	—	23,839,428	—
From 1811 to 1820	18,227,100	10,020,639	—	—	—	—	—	28,247,739	4,408,311
From 1821 to 1830	20,649,788	13,527,941	110,211	—	—	—	—	34,287,940	6,040,201
From 1831 to 1840	25,429,476	12,164,794	8,293,984	—	—	—	—	45,888,254	11,600,514
From 1841 to 850	32,185,304	18,340,200	11,019,714	*6,581,089	†1,249,143	—	—	69,375,400	23,487,146
From 1851 to 1860	36,861,881	23,223,184	3,261,307	17,315,773	3,895,599	—	—	89,577,744	20,202,344
From 1861 to 1868‡	37,745,351	28,099,551	15,865	13,636,376	3,097,375	2,320,824	§367,321	85,332,673	—
Total	186,567,714	113,746,953	22,721,661	37,533,188	8,242,117	2,320,824	367,321	376,569,178	8,539,324

* Shipments for six years from 1845 to 1850.
† Shipments for the years 1866, 1867, and 1868.
‡ For eight years only. The exports of 1869 amounted to 10,531,532 tons.
§ Shipments for three years from 1848 to 1850.

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Appendix, Table No. 71.

Distribution of Coal by the North-Eastern Railway.

Distribution.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.		Tons. cwts.	Tons. cwts.	Tons. cwts.
The quantity of coal carried over the North-eastern Railway for local consumption and land sale from the Durham and Northumberland coalfields, and which was distributed over the districts Berwick and Kelso in the north, Carlisle and Tebay in the west, and Leeds, Knottingley, and Altofts in the south	1,631,143 6	1,673,277 14	1,774,416 7	1,835,032 9	2,918,097 12	3,375,668 13	4,212,183 2		4,221,655 0	4,171,663 14	4,713,252 19
For shipment at Hull	646 7	98 13	1,414 2	929 12	176 14	—	—		15 0	1,059 14	—
For North-eastern Company's use, coal	45,015 19	43,779 17	40,277 4	40,823 10	57,626 17	82,966 2	98,799 0		215,576 8	196,775 0	238,773 0
The quantity of coal passed over the North-eastern Railway to districts south of Altofts, Knottingley, and Leeds, and also of coal to places north of Kelso and Berwick, and west of Morpeth, Hexham, Carlisle, and Tebay, being the entire through traffic of coal	137,487 8	149,551 18	171,921 6	218,161 15	322,196 4	476,503 8	590,960 3	Tons. Coke, 2,598,281.	645,056 9	606,532 5	657,725 2
The quantity of coke carried over the North-eastern Railway for local consumption and land sale between Kelso and Berwick in the north, Carlisle and Tebay in the west, and Leeds, Knottingley, and Altofts in the south*	116,773 12	145,721 16	193,062 16	248,118 15	900,975 19	968,801 17	1,304,099 13	Tons. † Coal, 9,913,666.	1,475,005 15	1,470,804 13	1,696,061 19
Shipped at Hull	475 12	166 9	328 15	2,340 16	211 9	908 5	2,547 19		816 0	333 5	156 3
For North-eastern Company's use, coke	154,840 2	169,970 11	180,537 0	181,141 0	203,422 8	226,219 6	286,975 0		231,692 3	202,503 0	172,226
The quantity of coke carried over the North-eastern Railway to districts south of Altofts, Knottingley, and Leeds, and also to places north of Kelso and Berwick, and north and west of Morpeth, Hexham, Carlisle and Tebay, being the entire through traffic of coke	297,382 13	392,836 8	288,672 14	360,043 2	463,686 5	622,533 4	594,021 10		724,336 0	708,596 6	803,095 7
Total carried	2,718,599 18	2,575,303 6	2,650,480 4	2,826,590 19	4,866,393 18	5,744,501 15	7,069,356 7	—	7,504,152 0	7,357,266 17	8,280,310 1

* Coke estimated at 60 per cent. of the coal used. This is taken as the mean average of many returns, varying from 57 per cent. to 65 per cent.

† The return for this year was given in a different form from those for other years, and included the coal carried to the ports for shipment, and which appears in the statement of the shipments given. Still, as this return conveys much information as to the lines of distribution, it is given below:—

Statement showing the Quantity of Coal, &c., conveyed by the North-eastern Railway Company during the year 1866 from the Northumberland and Durham Coalfield.

	Coal.	Coke.
	Tons.	Tons.
Quantity of coal, &c., sent by North-eastern Railway to York for conveyance thence via Great Northern Railway	441,093	54,352
Quantity of coal, &c., carried by North-eastern Railway to Altofts for conveyance by London and North-western, Midland and other Companys to places south of Altofts	1,561	102,896
Quantity of coal carried to Leeds for conveyance beyond	225	48,198
Quantity of coal carried to Carlisle for conveyance beyond	118,546	179,511
Quantity of coal carried to Tebay for conveyance beyond	24,765	305,571
Quantity of coal carried to Berwick for conveyance beyond	15,634	12,183
Quantity of coal carried to Hexham for conveyance beyond	1,619	19,405
Quantity of coal, &c. conveyed by North-eastern Railway to Tyne Dock for shipment	2,188,548	167,913
Quantity of coal, &c. conveyed by North-eastern Railway to Sunderland for shipment	979,140	16,348
Quantity of coal, &c. conveyed by North-eastern Railway to Hartlepool for shipment	863,014	7,386
Quantity of coal, &c. conveyed by North-eastern Railway to Redheugh for shipment	25,131	208
Quantity of coal, &c. conveyed by North-eastern Railway to West Hartlepool for shipment	603,784	21,871
Quantity of coal, &c. conveyed by North-eastern Railway to Port Clarence for shipment	15,043	2,550
Quantity of coal, &c. conveyed by North-eastern Railway to Portrack Spout for shipment	798	—
Quantity of coal, &c., conveyed by North-eastern Railway to Hull for shipment	1,009	555
Quantity of coal, &c., conveyed by North-eastern Railway to Middlesbro' and Stockton for shipment	249,473	22,047
Quantity of coal carried by North-eastern Railway to places on North-eastern line for manufacturing and household purposes	4,200,134	1,414,427
Quantity of coals, &c. consumed by North-eastern Company's engines, &c.	188,066	223,160
Total	9,917,493	2,598,281

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Shipments from all Ports other than the Ports on the TYNE, WEAR, and TEES since 1850.

Appendix, Table No. 72.

Shipments of Coal from WHITEHAVEN since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	226,266	3,159	229,425
1852	222,208	1,627	223,835
1853	223,143	2,072	225,215
1854	215,544	2,747	218,291
1855	206,383	2,341	208,724
1856	208,722	3,943	212,665
1857	193,603	3,575	197,178
1858	180,346	2,036	182,382
1859	189,305	1,487	190,792
1860	191,079	3,441	194,520
Total	2,056,599	26,428	2,083,027
1861	183,366	2,598	185,964
1862	197,550	965	198,515
1863	152,945	769	153,714
1864	147,727	1,103	148,830
1865	146,589	1,454	148,043
1866	147,099	2,115	149,214
1867	169,954	1,506	171,460
1868	143,694	1,132	144,826
1869	148,478	818	149,296
1870	—	—	—
Total for 9 years	1,437,402	12,460	1,449,862

Decrease Coastwise 35,187 tons.
Increase Foreign 282 ,,
Total Decrease 34,905 ,,
Decrease per cent. 15·21 ,,

Decrease Coastwise 34,888 tons.
Do. Foreign 1,780 ,,
Total Decrease 35,668 ,,
Decrease per cent. 24·62 ,,

Appendix, Table No. 74.

Shipments of Coal from WORKINGTON since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	95,703	140	95,843
1852	85,014	500	85,514
1853	126,289	1,267	127,556
1854	117,811	1,664	119,475
1855	111,216	1,210	112,426
1856	129,410	1,514	130,924
1857	133,872	2,757	136,629
1858	133,231	1,325	134,556
1859	126,436	675	127,111
1860	134,339	1,964	136,303
Total	1,193,321	13,016	1,206,337
1861	128,959	2,124	131,083
1862	144,294	8,379	152,673
1863	140,411	1,344	141,755
1864	136,982	1,211	138,193
1865	145,666	840	146,506
1866	137,453	130	137,583
1867	136,607	..	136,607
1868	106,886	1,446	108,332
1869	99,484		
1870	—	—	—
Total for 9 years	1,077,258	15,474	1,092,732

Increase Coastwise 38,656 tons.
Do. Foreign 1,884 ,,
Total Increase 40,440 ,,
Increase per cent. 43·21 ,,

Decrease Coastwise 22,073 tons.
Do. Foreign 678 ,,
Total Decrease 22,751 ,,
Decrease per cent. 17·35 ,,

Appendix, Table No. 73.

Shipments of Coal from MARYPORT since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	201,676	1,753	203,429
1852	230,012	2,492	232,504
1853	269,011	2,310	271,321
1854	304,197	3,184	307,381
1855	283,603	2,503	286,106
1856	295,466	4,075	299,541
1857	337,338	3,534	340,872
1858	329,459	2,244	331,703
1859	382,093	7,103	389,196
1860	386,372	6,446	392,818
Total	3,019,227	35,644	3,054,871
1861	380,304	7,825	388,129
1862	382,725	8,800	391,525
1863	413,863	8,036	421,899
1864	438,954	4,718	443,672
1865	459,725	6,976	466,701
1866	431,239	4,328	435,567
1867	476,162	4,085	480,247
1868	406,969	8,086	415,055
1869	422,622	7,256	429,878
1870	—	—	—
Total for 9 years	3,813,563	60,110	3,872,673

Increase Coastwise 184,696 tons.
Do. Foreign 4,693 ,,
Total Increase 189,389 ,,
Increase per cent. 93·09 ,,

Increase Coastwise 42,318 tons.
Decrease Foreign 569 ,,
Total increase 41,749 ,,
Increase per cent. 10·75 ,,

Appendix, Table No. 75.

Shipments of Coal from LIVERPOOL since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	115,904	255,256	371,160
1852	105,932	277,645	383,577
1853	123,871	333,602	457,473
1854	105,030	347,222	452,252
1855	116,212	424,059	540,271
1856	136,260	423,869	560,129
1857	166,952	513,794	680,746
1858	169,176	474,713	643,889
1859	195,263	581,608	776,871
1860	234,701	595,639	830,340
Total	1,469,301	4,227,398	5,696,699
1861	230,389	643,925	874,314
1862	134,450	636,833	771,283
1863	164,024	573,473	737,497
1864	228,152	716,908	944,160
1865	223,839	637,750	861,589
1866	265,576	729,854	995,430
1867	277,579	682,401	959,980
1868	226,275	656,290	882,565
1869			
1870	—	—	—
Total for 9 years	4,750,284	5,276,533	7,026,817

Increase Coastwise 118,797 tons.
Do. Foreign 340,385 ,,
Total Increase 459,180 ,,
Increase per cent. 183·71 ,,

Decrease Coastwise 4,114 tons.
Increase Foreign 12,805 ,,
Increase Total 8,691 ,,
Increase per cent. ·94 ,,

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APPENDIX, TABLE No. 76.

SHIPMENTS of COAL from RUNCORN since 1857.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1857 - -	..	80	80
1858 - -	..	795	795
1859 - -	..	1,448	1,448
1860 - -	..	916	916
Total - -	..	3,239	3,239
1861 - -	..	1,220	1,220
1862 - -	89,790	1,308	91,008
1863 - -	103,339	3,220	106,559
1864 - -	115,556	8,605	124,161
1865 - -	128,773	6,641	135,414
1866 - -	116,937	5,997	122,934
867 - -	87,522	2,152	89,674
1868 - -	45,049	510	45,559
1869 - - -	55,691	1,927	57,618
1870 - -	—	—	—
Total for 9 years	742,567	31,580	774,147

Increase, Foreign 836 tons.
Total increase 836 " "
Increase per cent. 1·05

Decrease Coastwise 34,000 tons.
Increase Foreign 619 " "
Total decrease 33,590 " "
Decrease per cent.* 36·00

* In computing the per-centage of Decrease the total shipments of 1862 is taken as a basis.

APPENDIX, TABLE No. 77.

SHIPMENTS of COAL from PRESTON since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	42,257	3,542	45,799
1852 - -	37,918	763	38,681
1853 - -	34,971	775	35,746
1854 - -	30,892	..	30,892
1855 - -	33,721	..	33,721
1856 - -	33,829	..	33,829
1857 - -	35,645	..	35,645
1858 - -	33,944	2,143	36,087
1859 - -	31,196	2,139	33,335
1860 - -	40,931	823	41,754
Total - -	354,304	10,184	364,488
1861 - -	40,302	160	40,462
1862 - -	41,718	..	41,718
1863 - -	42,065	1,045	43,110
1864 - - -	40,242	445	40,687
1865 - -	40,062	1,785	41,847
1866 - -	34,535	1,837	36,372
1867 - -	31,267	351	31,618
1868 - -	21,758	430	22,188
1869 - - -	23,100	547	23,647
1870 - -	—	—	—
Total for 9 years	315,039	6,600	321,639

Decrease Coastwise 1,838 tons.
Increase Foreign 2,730 " "
Total Decrease 4,046 " "
Decrease per cent. 6·63

Decrease Coastwise 17,902 tons.
Increase Foreign 337 " "
Total decrease 16,815 " "
Decrease per cent. 71·1

APPENDIX, TABLE No. 78.

SHIPMENTS of COAL from FLEETWOOD since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	9,898	1,688	11,586
1852 - -	9,349	1,015	10,364
1853 - -	11,414	550	11,964
1854 - -	21,058	1,350	22,408
1855 - -	32,070	970	33,040
1856 - -	36,019	1,555	37,574
1857 - -	38,037	1,873	39,910
1858 - -	32,686	2,797	35,483
1859 - -	24,656	6,260	30,916
1860 - -	23,652	4,366	28,018
Total - -	238,839	22,424	261,263
1861 - -	14,169	1,733	15,872
1862 - -	13,016	300	13,316
1863 - -	17,287	1,578	18,865
1864 - -	17,067	502	17,539
1865 - -	16,225	1,323	17,548
1866 - -	12,315	474	12,789
1867 - -	10,912	1,010	11,922
1868 - -	6,809	194	7,003
1869 - - -	24,831	600	25,431
1870 - - -	—	—	—
Total for 9 years	137,591	7,684	145,275

Increase Coastwise 13,754 tons.
Do. Foreign 2,673 " "
Total increase 16,428 " "
Increase per cent. 141·88

Increase Coastwise 10,653 tons.
Decrease Foreign 1,183 " "
Total Increase 9,549 " "
Increase per cent. 60·00

APPENDIX, TABLE No. 79.

SHIPMENTS of COAL from LANCASTER since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	5,337	315	5,652
1852 - -	4,838	470	5,308
1853 - -	4,116	1,242	5,358
1854 - -	8,538	2,126	10,664
1855 - -	11,960	1,110	13,070
1856 - -	9,334	2,147	11,481
1857 - -	8,879	2,244	11,123
1858 - -	7,083	3,024	10,107
1859 - -	2,319	2,792	5,111
1860 - -	2,532	2,225	4,757
Total - -	64,936	17,695	82,631
1861 - -	4,489	3,860	8,349
1862 - -	2,550	2,862	5,412
1863 - -	1,606	2,652	4,258
1864 - -	1,583	1,480	3,063
1865 - -	1,730	2,703	4,433
1866 - -	1,775	2,164	3,939
1867 - -	1,461	2,472	3,935
1868 - -	1,697	3,091	4,788
1869 - - -	1,341	4,364	5,705
1870 - - -	—	—	—
Total for 9 years	18,232	25,648	43,880

Decrease Coastwise 2,506 tons.
Increase Foreign 1,910 " "
Decrease, total 596 " "
Do. per cent. 12·33

Decrease Coastwise 3,146 tons.
Increase Foreign 504 " "
Total decrease 2,644 " "
Decrease per cent. 46·00

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APPENDIX, TABLE No. 80.

SHIPMENTS of COAL from CHESTER since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	101,044	949	101,993	
1852 - -	85,772	1,071	86,843	
1853 - -	81,312	1,009	82,321	
1854 - -	91,469	360	91,829	
1855 - -	85,834	230	86,064	
1856 - -	75,915	365	76,280	
1857 - -	73,850	107	73,957	
1858 - -	56,123	834	56,957	
1859 - -	63,709	4,474	68,183	
1860 - -	56,838	200	57,038	
Total - -	771,866	9,599	781,465	Decrease Coastwise 44,206 tons. Do. Foreign 7·49 Total decrease 44,855 Decrease per cent. 44·07
1861 - -	61,730	550	62,280	
1862 - -	65,724	989	66,713	
1863 - -	61,866	1,431	63,297	
1864 - -	49,739	2,283	52,022	
1865 - -	51,843	327	52,170	
1866 - -	59,818	600	60,418	
1867 - -	79,433	15	79,448	
1868 - -	66,412	750	67,162	
1869 - - -	73,813	2,797	73,610	
1870 - - -	..	..	..	
Total for 9 years	570,378	9,742	577,120	Increase Coastwise 13,083 tons. Do. Foreign 2,247 Total increase 11,330 Increase per cent. 18·19

APPENDIX No. 81.

LEEDS AND LIVERPOOL CANAL.

COALS RECEIVED AT THE FOLLOWING PLACES, 1868.

LANCASHIRE.

Lancashire Coals.	Tons.
Aintree	1,487
Appley	52
Barrowfield	3,445
Blackburn	170,125
Blakey Edge	1,030
Bootle	19,434
Brownhouse	768
Brynn Moss	80
Burnley	13,655
Burscough	2,538
Church	22,599
Coates	12,706
Crook	2,677
Eli Meadow	58
Enfield	24,063
Ford	80
Foulridge	2,350
Fox Hill	5,556
Gas Works	
Gorsey Lane	1,254
Green Bank	3,104
Halsall	96
Hapton	4,240
Heapy	3,543
Heaton Bridge	499¾
Hole House Bridge	31
Hollilroyd's	512
Ince	8,050¾
Johnson's Hill	252
Kirkdale	25,398½
Leigh	386,155
Linacre	16,577½
Litherland	6,208
Liverpool	480,213
Liverpool Junction	299
Livesey	17,668
Lock Head	8,660
Lodge Lane	267
Lydiate	114
Maghull	770
Moulden	1,080
Newbrough	1,424½
Norden	71
Parbold	2,673¼
Plank Lane	10
Reediford	7,765
Riley's Bridge	24
Riley Green	2,541
Rishton	5,957
Rose Bridge	1,208
Rufford	216
Sandy Gate	2,630
Scarisbrick	597
Side Beet	352
Tarleton	10,547
Upholland	608
Whalley Road	3,058
Wheelton	124
Whitebirk	182
Wigan	6,710
Withnell	12,463
Total	1,306,856¼

APPENDIX, TABLE No. 82.

SHIPMENTS of COAL from GAINSBOROUGH since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	9,577	..	9,577	
1852 - -	7,605	..	7,605	
1853 - -	4,551	150	4,701	
1854 - -	6,077	..	6,077	
1855 - -	5,032	..	5,032	
1856 - -	8,366	100	8,466	
1857 - -	8,038	.	8,038	
1858 - -	12,236	242	12,478	
1859 - -	10,447	..	10,447	
1860 - -	17,945	3,023	20,968	
Total - -	89,874	3,515	93,389	Increase Coastwise 8,368 tons. Do. Foreign 2,573 Total Increase 11,941 Increase per cent. 117·87
1861 - -	15,796	1,587	17,383	
1862 - -	16,949	1,702	18,651	
1863 - -	16,172	1,113	17,285	
1864 - -	10,879	375	11,254	
1865 - -	15,063	984	16,047	
1866 - -	15,063	245	15,308	
1867 - -	15,132	174	15,306	
1868 - -	12,052	658	12,710	
1869 - -	10,311	389	10,700	
1870 - - -	—	—	—	
Total for 9 years	127,417	7,227	134,644	Decrease Coastwise 5,468 tons. Do. Foreign 1,198 Total Decrease 6,666 Decrease per cent. 52·58

APPENDIX, TABLE No. 83.

SHIPMENTS from SCARBOROUGH.

Years.	Coastwise.	Foreign.	Total.
	Tons.	Tons.	Tons.
1859 - - - -	..	190	190
1863 - - - -	180	..	180
Total - - - -	180	190	370

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Appendix, Table No. 84.

Shipments of Coal from Hull since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	12,735	64,543	77,278	
1852 -	10,113	52,661	62,774	
1853 - -	2,859	51,750	54,609	
1854 - -	7,644	54,301	61,945	
1855 - -	14,952	64,241	79,192	
1856 - -	14,644	117,855	132,499	
1857 - - -	15,156	140,414	155,570	
1858 - -	10,349	132,274	142,603	
1859 - -	11,573	149,891	161,464	
1860 - -	10,149	159,261	169,410	
Total - -	110,174	987,170	1,097,344	
1861 - -	14,040	131,143	145,183	
1862 - -	10,824	195,627	206,451	
1863 - -	12,434	176,572	189,006	
1864 - -	11,728	158,097	169,825	
1865 - -	19,637	202,813	222,450	
1866 - -	13,551	184,027	197,578	
1867 - -	11,268	164,057	175,325	
1868 - -	22,162	183,037	205,199	
1869 - -	20,044	172,302	192,346	
1870 - - -	—	—	—	
Total for 9 years	135,688	1,567,675	1,703,363	

Decrease Coastwise 2,536 tons.
Increase Foreign 94,718 " "
Total Increase 92,132 " "
Increase per cent. 119·23

Increase Coastwise 6,004 tons.
Do. Foreign 41,169 " "
Total Increase 47,163 " "
Increase per cent. 32·14 " "

Appendix, Table No. 85.

Shipments of Coal from Goole since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	104,336	5,681	110,017	
1852 - -	96,083	2,922	99,005	
1853 - -	90,468	2,070	92,538	
1854 - -	75,365	1,685	77,050	
1855 - -	85,740	1,797	87,537	
1856 - -	97,268	893	98,161	
1857 - -	107,989	8,647	116,636	
1858 - -	90,869	15,293	106,162	
1859 - -	89,740	18,771	108,511	
1860 - -	95,776	15,452	111,228	
Total - -	933,634	73,211	1,006,845	
1861 - -	94,508	8,065	92,573	
1862 - -	92,936	13,586	106,522	
1863 - -	94,527	21,782	116,309	
1864 - -	109,496	12,872	122,368	
1865 - -	118,533	4,935	123,468	
1866 - -	97,813	8,288	106,101	
1867 - -	76,527	16,316	92,843	
1868 - -	83,901	15,222	99,123	
1869 - - -	93,208	15,983	109,191	
1870 - -	—	—	—	
Total for 9 years	851,449	117,049	968,498	

Decrease Coastwise 8,500 tons.
Increase Foreign 9,771 " "
Total Increase 1,271 " "
Increase per cent. 110 " "

Decrease Coastwise 1,300 tons.
Increase Foreign 7,918 " "
Total Increase 16,618 " "
Increase per cent. 17·95 " "

Appendix, Table No. 86.

Shipments of Coal from Grimsby since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	470	4,146	4,616	
1852 - -	490	3,581	4,071	
1853 - -	397	2,656	3,053	
1854 - -	821	2,800	3,621	
1855 - -	1,974	6,414	8,388	
1856 - -	2,418	54,100	56,518	
1857 - -	4,705	74,425	79,130	
1858 - -	7,322	93,182	100,504	
1859 - -	8,233	102,714	110,947	
1860 - -	9,555	70,943	80,498	
Total - -	36,385	414,961	451,346	
1861 - -	9,627	81,658	91,285	
1862 - -	11,796	86,460	98,256	
1863 - -	17,836	127,585	145,421	
1864 - -	20,541	127,474	148,015	
1865 - -	19,493	172,097	191,590	
1866 - -	34'969	183,753	218,722	
1867 - -	44,923	196,266	241,189	
1868 - -	37,479	228,787	266,266	
1869 - -	35,362	220,507	255,869	
1870 - - -	—	—	—	
Total for 9 years	232,026	1,424,587	1,656,613	

Increase Coastwise 9,055 tons.
Do. Foreign 66,797 " "
Total Increase 75,853 " "
Increase per cent. 1645·38 " "

Increase Coastwise 22,735 tons.
Do. Foreign 138,949 " "
Total Increase 164,584 " "
Increase per cent. 186·36 " "

Appendix, Table No. 87.

Shipments of Coal from Boston since 1858.

A small Return of 15 tons alone is all that appears before this Date.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1859 - -	..	200	200	
1860 - -	110	954	1,064	
Total - -	110	1,154	1,264	
1861 - -	82	340	422	
1862 - -	970	621	1,591	
1863 - -	522	85	607	
1864 - -	205	..	205	
1865 - -	356	241	597	
1866 - -	23	..	23	
1867 - -	60	..	60	
1868 - -	..	..	..	
1869 - - -	..	..	..	
1870 - -	..	..	..	
Total for 7 years	2,217	1,287	3,504	

Increase Foreign 754 tons.
Total Increase 754 " "
Increase per cent. 877·00 " "

Decrease Coastwise 23 tons.
Do. Foreign 99 " "
Total Decrease 121 " "
Decrease per cent. 28·67 " "

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APPENDIX, TABLE No. 88.—COAL arriving in HULL by RIVER and RAILWAY. (From the Coal Inspectors' Returns).

	1865.						1866.						1867.					
	RIVER.			RAILWAY.			RIVER.			RAILWAY.			RIVER.			RAILWAY.		
	Export.	Home.	Total.	Export.	Home.	Total.	Export.	Home.	Total.	Export.	Home.	Total.	Export.	Home.	Total.	Export.	Home.	Total.
January	—	—	—	—	—	—	28,014	23,148	51,162	4,322	4,718	9,040	7,860	8,052	15,912	7,649	4,288	11,937
February	—	—	—	—	—	—	13,720	16,828	30,548	2,515	3,791	6,306	15,612	20,564	36,176	4,630	5,448	10,078
March	—	—	—	—	—	—	18,718	15,246	33,964	5,492	4,332	9,824	21,896	14,216	35,612	7,407	4,132	11,539
April	—	—	—	—	—	—	26,688	16,980	43,668	6,242	4,127	10,369	24,208	13,880	38,088	4,904	4,243	9,147
May	—	—	—	—	—	—	46,104	16,028	62,132	6,217	3,234	9,451	23,416	15,480	38,896	6,376	3,057	9,433
June	—	—	—	—	—	—	35,120	18,012	53,132	8,657	4,160	12,817	33,808	21,076	54,884	5,413	4,939	10,352
First Half year	—	—	—	—	—	—	168,364	106,242	274,606	33,445	24,362	57,807	126,200	91,268	217,568	36,379	26,107	62,486
July	16,033	9,468	25,501	2,754	1,907	4,661	24,808	16,032	40,840	5,744	2,796	8,540	24,128	13,548	37,676	5,626	4,528	10,154
August	21,933	8,884	30,817	3,895	2,097	5,992	28,020	11,192	39,212	8,262	2,837	11,099	26,836	12,480	39,316	6,798	2,499	9,297
September	18,872	12,200	31,072	4,443	2,356	6,799	26,976	14,508	41,484	7,600	3,049	10,049	30,168	13,164	43,332	7,829	2,713	10,542
October	28,178	15,702	88,880	9,542	3,147	12,689	26,356	13,388	39,744	7,525	3,003	10,528	27,812	16,096	43,908	5,392	3,716	9,108
November	34,684	13,292	47,976	16,537	3,561	20,098	22,660	14,676	37,336	9,677	3,416	13,093	44,908	27,280	72,188	10,788	5,864	16,652
December	39,324	26,540	65,864	5,415	6,128	11,543	26,740	27,432	54,172	9,252	8,202	17,454	23,148	23,504	45,652	2,865	3,857	6,722
Second Half Year	154,024	86,086	240,110	42,586	19,196	61,782	155,560	97,228	252,788	48,060	23,303	71,363	177,000	105,072	282,072	39,298	23,177	62,475
Yearly Total	—	—	—	—	—	—	323,924	203,470	527,394	81,505	47,665	129,170	303,300	196,340	499,640	75,677	49,284	124,961
A. and C. N.	—	—	—	—	—	—	98,168	105,491	203,659	—	—	—	—	—	—	—	—	—
Sloop Cargoes	2,236	1,286	3,522	—	—	—	4,685	3,031	7,716	—	—	—	3,115	—	3,115	—	—	—

	1868.						1869.						1870.
January	14,820	14,732	29,552	2,664	2,921	5,585	26,200	22,128	48,328	7,128	4,449	11,577	
February	15,064	12,480	27,544	3,857	2,515	6,372	17,756	12,304	30,060	2,861	2,985	5,846	
March	20,626	12,010	32,636	5,408	2,322	7,730	27,292	14,052	41,344	5,101	3,378	8,479	
April	24,824	13,248	38,072	9,643	2,573	12,216	23,964	13,912	37,876	4,120	3,708	7,828	(Return not complete at date of printing.)
May	27,664	11,220	38,884	10,372	2,920	13,292	20,208	10,052	30,260	6,910	2,555	9,765	
June	24,136	8,392	32,528	4,213	2,261	6,474	23,264	10,840	34,104	6,574	2,732	9,306	
Total First Half-Year	127,074	72,142	199,216	36,157	15,512	51,669	138,684	83,288	221,972	32,694	19,807	52,501	
July	24,668	12,124	36,792	8,765	2,408	11,173	27,128	10,244	37,372	6,000	2,183	8,183	
August	40,296	18,652	58,148	11,915	3,222	15,137	35,696	13,608	49,304	15,449	3,853	19,302	
September	{ 36 / 26,044 }	14,868	40,948	5,935	2,925	8,860	24,236	13,328	37,564	5,785	2,863	8,648	
October	24,252	14,944	39,196	7,054	3,091	10,145	20,480	14,452	34,932	6,714	2,939	9,653	
November	22,040	22,540	45,480	6,009	3,787	9,796	20,952	18,092	39,044	11,799	3,491	15,290	
December	24,820	18,196	43,016	9,531	4,020	13,551	21,728	21,068	42,796	20,175	4,464	24,639	
Total Second Half-Year	165,056	101,324	264,380	49,209	19,453	68,662	150,220	90,792	241,012	65,922	19,793	85,715	
	290,130	173,466	463,596	85,366	34,965	120,331	288,904	174,080	462,984	98,616	39,600	138,216	

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APPENDIX No. 89.

The MIDLAND RAILWAY in 1856 carried from the collieries north of Derby, the Erewash Valley, and the Leicestershire collieries, coal to the following places :—

	Tons.
Morecambe, for shipment	5,920
Morecambe	1,522
Lancaster	2,765
Halton	348
Caton	1,877
Hornby	3,173
Wennington	502
Bentham	1,124
Ingleton	279
Clapham	540
Lettle	4,604
Long Preston	767
Hellefield	409
Bell Busk	1,460
Gargrave	121
Colne	116
Foulridge	641
Earby	3,982
Thornton	516
Elslack	36
Skipton	2,152
Connonley	2,633
Kildwick	3,370
Steeton	1,973
Keighley	23,433
Bingley	2,543
Saltaire	5,728
Shipley	2,391
Bradford	4,034
Appetley	2,475
Calverley	675
Newley	5,782
Kirkstall Forge	11,124
Kirkstall	3,830
London and North-western Junction for North-eastern Railway	11,540
Leeds	17,633
Methley Junction for Great Northern	21,196
Altofts Junction for North-eastern Railway	11
Normanton	2,401
Oakenshaw	9
Cudworth	22
Darfield	22
Swinton for South Yorkshire Railway	1,467
Rotherham, Masboro', and Sheffield	52,658
Eckington for Manchester, Sheffield, and Lincoln	3,003
Chesterfield	34,700
Stretton	447
Wingfield	447
Belper	739
Duffield	1,161
Ambergate	11,152
Whatstandwell	135
High Peak Railway	385
Matlock	6,519
Darley Dale	1,736
Rowsley	12,665
Little Eaton	2,572
Derby	46,141
Willington	2,561
Willington Junction for North Stafford Railway	108,828
Burton and B and Walton	15,560
Wicknor Junction for South Stafford Railway	13,835
Haselour, Tamworth, and Wilnecote	2,138
Kingsbury, Whitacre, Coleshill, and Hampton	3,724
Forge Mills, Water Orton, and Castle Bromwich	1,856
Birmingham	48,959
Camphill, Moseley, and King's Norton	4,621
Burnt Green, Blackwell, and Bromsgrove	4,734
Stoke Works, Droitwich, and Fearnall Heath	5,627
Dunhampstead and Spetchley	1,331
Worcester and Oxford and Wolverhampton and Worcester stations	36,764
Wadboro' and Defford	321
Eckington and Breedon	1,859
Ashchurch and Tewkesbury	1,836
Cleere and Cheltenham	47,638
Gloucester	7,504
Stonehouse, Frocester, and Dursley	3,314
Berkeley Road and Charfield	340
Wickwar and Yate	340
Bristol and Great Western and Bristol and Exeter stations	65
Draycott, Long Eaton, and Beeston	7,044
Nottingham	33,172
Nottingham for Great Northern Railway	113,944
Carlton, Lowdham, Thurgarton, Fiskerton	6,177
Southwell and Newark	21,743
Collingham, Swinderby, and Thorpe	7,206
Lincoln and stations on Manchester, Sheffield, and Lincolnshire Railway	10,629
Radford, Basford, Bulwell	28,426
Hucknall, Linby, and Kirkby	5,808
Sutton and Mansfield	25,479
Stations on Erewash Valley Railway	72,656
Kegworth and Loughboro'	9,062
Barrow, Sileby, and Syston	11,050
Leicester	161,996
Stations between Leicester and Rugby, inclusive	31,412
Stations between Leicester and Burton	46,856
Brooksby, Kirby, and Melton	9,913
Saxby, Oakham, and Manton	18,399
Luffenham, Ketton, and Stamford	21,001
Hepstone and Peterborough	22,314
Peterborough for Eastern Counties Railway	252,484
Wansford, Oundle, Thrapstone, Higham F	17,975
Seaton, Rockingham, Medbourne, Market Harbro'	17,108
Theddingworth, Welford, and Stanford Hall	6,067
Coventry, Kenilworth, Leamington	19,224
Weedon, Crick, and Blisworth	24,885
Northampton and Wellingboro'	43,486
Wolverton Road and Bletchley	7,731
East Stratford, Woburn, and Ridgemont	8,330
Ampthill and Bedford	20,985
Winslow, Clayton, and Lauton	6,926
Bicester, Islip, and Oxford	47,826
Buckingham, Brackley, and Banbury	23,948
Swanbourne, Leighton, Farthinghoe	5,554
Dunstable, Tring, and Aylesbury	29,980
Berkhampstead, Boxmoor, and Langley	14,205
Watford, Bushy, and Harrow	9,182
LONDON stations	240,205
Kew Junction for South-eastern and South-western Railways	105,717

APPENDIX TABLE No. 90.

A STATEMENT of the TOTAL SALES of COAL by CANAL and RAILWAY from the Collieries of the EREWASH VALLEY DISTRICT from 1849 to 1869.

—	Canal.	Railway.	Total.	—	Canal.	Railway.	Total.
	Tons.	Tons.	Tons.		Tons.	Tons.	Tons.
1849	386,955	43,820	430,775	1860	223,292	1,222,906	1,446,198
1850	380,641	196,073	576,714	1861	218,421	1,282,669	1,501,090
1851	334,922	251,079	586,001	1862	249,932	1,297,590	1,547,522
1852	317,178	315,409	632,587	1863	223,972	1,347,944	1,571,916
1853	320,408	497,961	818,369	1864	210,311	1,652,228	1,862,539
1854	258,096	599,247	857,343	1865	210,440	1,641,542	1,859,982
1855	223,893	753,277	977,170	1866	217,593	1,745,819	1,963,412
1856	247,294	752,187	999,481	1867	196,579	1,749,225	1,945,804
1857	227,704	776,948	1,004,652	1868	186,145	1,571,474	1,754,619
1858	204,571	837,457	1,042,028	1869	192,902	1,709,061	1,901,963
1859	208,905	968,026	1,176,931				

N.B.—These figures do not include the local or land sales, nor the Quantities used in the district for iron-making purposes.

At least 1,500 tons a week, or 78,000 tons a year, during the above period, may be fairly added as representing the outsales of the district, *i.e.*, of collieries which are not the Erewash Valley Association's, and consequently not included in the above returns.

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APPENDIX No. 91.

EREWASH VALLEY CANAL.

A STATEMENT of the NUMBER of TONS of COAL navigated from the under-mentioned Collieries * by Canal in the Year 1867, showing the various places of Delivery.

Collieries.	Erewash Canal.	Shardlow.	Derby Canal.	Nottingham.	Redcliff.	Gunthorp, Bridgford, Burton-Joyce.	Wilford, Barton, Thrumpton.	Hoveringham, Stoke and Shelford, Fiskerton, Farndon, Hazleford.	Carlton and Sutton.	Clifton, Collingham, Muskham, Marnham, Beathorpe, Dunham.	Soar.	Loughborough.	Leicester Canal.	Leicester.	Union Canal.	Market Harborough.	Wreak.	Melton.	Newark, Kelham.	Grantham Canal.	Grantham.	Lincoln.	Boston and Horncastle, Dogdike.	Donington Bridge and Swineshead.	Sleaford.	Bourne, Spalding, and Deeping.	Gainsborough.	Grand Union.	Grand Junction Canal.	London.	Cromford Canal.	Grand Total.	Collieries.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
Beggarlee -	4,742½	—	—	506½	—	47½	16½	27½	—	—	—	454½	—	94½	—	85½	—	78	131½	41½	82	607½	38½	—	32	—	—	109	689	—	—	7,783½	Beggarlee.
Underwood -	763½	135	134½	1,259½	234½	442½	156½	853	409	1,515½	80½	1,863	—	573½	727½	627½	622	1,241½	2,208½	5,156	6,151	—	—	—	129½	—	—	377½	1164½	—	—	25,742½	Underwood.
Brinsley -	55½	—	—	369½	—	—	29½	25	—	19½	—	629½	—	177½	—	13	296	54	70½	241½	57½	25	—	—	—	—	—	55½	12	—	—	2,131	Brinsley.
Eastwood -	28½	—	—	9,334½	—	—	—	159½	—	44½	—	—	—	382½	—	44	—	—	885	283	—	—	—	—	—	—	—	—	597½	337½	—	12,031½	Eastwood.
Cotmanhay -	950	2,305	2,803½	—	—	—	—	—	—	—	59½	1,645½	—	3,700	24	416½	—	—	—	307½	—	—	—	—	—	—	—	270½	4,163	688½	—	17,338½	Cotmanhay.
Swanwick -	—	44	295½	—	—	—	—	—	—	—	—	—	—	—	42½	—	—	—	964½	151	—	—	—	—	—	—	—	236	78	—	1,976	4,291½	Swanwick.
Rutland -	66	1,467	2,394½	—	—	—	—	—	—	—	1,331	97½	—	339½	—	—	—	—	159½	1,472	—	—	—	—	—	—	—	—	111½	—	—	7,582½	Rutland.
Sleights -	—	—	1,315	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	22½	—	—	—	—	—	—	—	—	161½	—	767	978	Sleights.
Carnfield -	—	—	537½	391	—	—	—	—	—	916½	—	—	—	—	—	—	—	—	1,231½	220½	—	—	—	—	—	—	—	—	—	—	3,939½	7,328½	Carnfield.
Langton -	—	—	21½	155½	—	—	—	—	—	36	—	—	—	—	—	—	—	—	81½	93½	—	—	—	—	—	—	—	55½	—	—	571½	1,014½	Langton.
Merborough -	—	—	—	—	615½	124½	—	46½	351½	2,070½	133½	—	41	17½	15½	302	1,656	93½	22½	330½	—	—	—	—	—	—	—	—	318½	—	—	6,278½	Merborough.
Brands -	—	—	—	71½	95	90½	—	—	1,166½	450½	—	—	142½	—	—	1½	2	65½	232½	3½	—	—	—	—	—	—	—	—	102½	—	451	2,876	Brands.
New Main -	—	—	—	—	—	—	—	—	—	4½	—	—	—	2,329½	—	—	—	—	—	—	—	—	—	—	—	—	—	11½	475	—	56½	2,877	New Main.
Birchwood -	—	—	—	—	—	21½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,208	646	—	1,965½	Birchwood.
Ripley -	—	—	—	33½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	54½	88½	Ripley.
Hartshay -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	75½	—	6,643½	6,719	Hartshay.
Loscoe -	—	—	503	170½	—	26½	—	2½	226	398	—	—	69½	—	—	—	—	—	129½	1,251½	—	—	—	—	—	—	—	—	53½	—	—	—	2,330	Loscoe.
Langley -	—	—	—	76½	—	—	—	—	—	—	—	—	1,300	11½	—	—	—	—	—	41½	—	—	—	—	—	—	—	—	827	—	—	2,357	Langley.
Coates Park -	—	—	1,076½	29½	—	—	40½	—	—	—	175½	—	—	321½	—	—	—	—	929½	—	—	—	—	—	—	—	—	—	243½	88½	—	2,904½	Coates Park.
Riddings -	—	—	186½	—	—	—	—	—	—	—	—	—	—	37	—	—	—	—	—	40½	—	—	—	—	—	—	—	—	—	—	—	263½	Riddings.
Pentrich -	—	—	789	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	293½	591½	13,526½	15,200½	Pentrich.
Babbington -	6,327½	—	206½	6,852	—	88½	—	202½	—	—	40	76½	—	42½	—	—	—	480½	930	235½	—	—	—	—	—	—	—	—	—	—	—	15,481½	Babbington.
Nuttall -	—	—	—	794½	—	27	—	—	—	—	—	—	—	—	—	—	—	—	9	—	—	—	—	—	—	—	—	—	—	—	—	830½	Nuttall.
Newcastle -	—	—	45	5,979½	—	19½	—	46	—	—	—	—	—	—	—	—	—	—	615½	169½	—	—	—	—	—	—	—	—	—	—	—	6,874	Newcastle.
Kimberley -	—	—	62½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	62½	Kimberley.
Hucknall -	—	—	—	822½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	712½	—	—	—	—	—	—	—	—	109½	132	—	23	1,800	Hucknall.
Total -	12,933½	3,951	9,070½	26,847	945½	887½	243	1,362½	2,152½	5,456	1,820	4,766½	2,676½	8,027½	749	1,489½	2,882	2,355½	8,292½	10,045	6,290½	632½	38½	—	1,325½	—	—	1,224½	9,752½	2,352½	28,009	156,579	Total.
Shipley -	559	—	389	1,829	—	—	—	—	—	—	1,275	1,046	1,357	4119	—	—	—	288	—	—	—	—	—	—	—	—	—	28	5,782	1,330	—	13,002	Shipley.
Hallam -	1,255	1,765½	3,120	755	—	—	—	—	—	—	1,735	3,534½	—	266	—	23½	88½	160	—	—	—	—	—	—	—	—	—	—	—	54	—	12,156½	Hallam.
Bennerley -	136½	—	117	218	—	—	—	—	—	—	658½	55	—	83	—	—	—	—	—	—	29	—	—	—	—	—	—	—	29	—	—	1,326	Bennerley.
Gilt Brook -	81½	—	115½	9,419½	1,466½	701½	35	335½	43½	335½	87	496	193	1,420½	156	1,220	131	—	3,893½	1,035½	114½	141½	—	—	—	—	—	2,962½	10,186½	165½	—	34,787½	Gilt Brook.
Awsworth -	—	—	—	1,010½	—	—	—	171½	—	195½	327	366	154½	196	—	43	—	—	40½	—	42½	—	—	—	—	—	—	—	—	—	—	1,093½	Awsworth.
Digby -	140	—	157½	4,679	—	451½	—	—	—	—	—	—	335	41½	—	—	—	25	1,865	236½	193½	—	—	—	—	—	—	—	493½	55	—	9,095½	Digby.
Heanor -	—	45	123	290½	—	—	—	—	—	—	—	—	—	631½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	859½	Heanor.
Ambergate -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	631½	Ambergate.
Total -	15,105½	5,761½	13,092½	45,057½	2,412	2,021½	278	1,870	2,196	5,987	5,502½	10,063½	4,706	14,785	905	2,776½	3,101½	2,823½	14,091½	11,367½	6,660	774½	38½	—	1,325½	—	—	4,215½	26,246½	3,956½	28,009	285,130½	Total.

	Tons.
Erewash Canal sale - - -	117,803½
Nottingham do. do. - - -	89,318
Cromford do. do. - - -	28,009
Total - -	235,130½

* In the Erewash Valley district situated contiguous to, and having wharves upon, the Erewash, Nottingham, and Cromford Canals.

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Appendix No. 92.

The Cromford Canal.

Total Amount of Coal Laden and Delivered at the respective Places, as under, Year ending December 31, 1867.

Collieries.	Places of Delivery.	Boats.	Hard.	Soft.	Cobbles.	Cokes.	Total.
			Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
Swanwick - -	Cromford - -	92	311 15	—	1,606 5	—	1,918 0
	Railway - -	3	58 0	—	—	—	58 0
Brands - - -	Lea - - -	19	—	451 0	—	—	451 0
New Main - -	Lea - - -	3	—	56 15	—	—	56 15
Ripley - -	Lea - - -	3	—	—	54 15	—	54 15
	Cromford - -	40	—	378 15	196 0	—	574 15
Sleights - - -	Railway - -	11	45 15	117 0	29 10	—	192 5
	Cromford - -	180	445 15	282 10	2,917 5	—	3,625 10
Camfield - -	Railway - -	17	221 5	8 0	84 10	—	313 15
Langton - -	Cromford - -	35	—	167 10	404 0	—	571 10
	Cromford - -	29	—	230 10	334 10	—	565 0
	Railway - -	5	48 0	5 0	67 0	—	115 0
Hartshay - -	Whatstandwell -	68	—	589 15	756 10	—	1,346 5
	Lea - - -	125	—	979 15	1,990 10	—	2,970 5
	Hagtum - -	85	1,047 0	—	—	—	1,047 0
	Cromford - -	170	50 0	1,274 5	2,547 10	—	3,871 15
	Railway - -	118	686 10	19 15	1,816 0	7 0	2,529 5
Pentrich - -	Whatstandwell -	93	350 5	857 10	653 0	—	1,860 15
	Saw Mill - -	7	—	—	144 5	—	144 5
	Hagtum - -	305	2,627 10	—	—	2,492 15	5,120 5
Hucknall - -	Bull Bridge - -	1	—	23 0	—	—	23 0
	Total - -	1,408	6,486 15	5,421 0	13,601 10	2,499 15	28,009 0

Appendix, Table No. 93.

Birmingham Canal Navigations.

Synopsis of the Tonnages in the Year 1832.

	Tons.	Cwt.	Tons.	Cwt.	Total.	
COAL, for supply of Birmingham - - -			324,563	18		
vid Worcester Canal - - - -	179,121	12				
vid Warwick Canal - - - -	218,764	16				
vid Coventry Canal - - - -	51,416	7				
vid Staffordshire and Worcestershire Canal -	66,303	12				
from Whittington to Fazeley - - -	12,156	8	527,762	15		
for supply of works in the mining district -			718,552	9	1,570,879	2
Total tons - -					1,570,879	2

Synopsis of the Tonnages in the Year 1840.

	Tons.	Cwt.	Tons.	Cwt.	Total.	
COAL, for supply of Birmingham - - -			443,271	12		
vid Worcester Canal - - - -	161,445	17				
vid Warwick Canal - - - -	174,560	16				
vid Coventry Canal - - - -	8,572	—				
vid Staffordshire and Worcestershire Canal -	42,772	9				
from Whittington to Fazeley - - -	11,262	9	398,613	11		
for supply of works in the mining district -			1,048,926	10	1,890,811	13
Total tons - -					1,890,811	13

Synopsis of the Tonnages in the Year 1850.

	Tons.	Cwt.	Tons.	Cwt.	Total.	
COAL, for supply of Birmingham - - -			560,119	2		
vid Worcester Canal - - - -	262,661	17				
vid Warwick Canal - - - -	104,680	4				
vid Coventry Canal - - - -	4,353	5				
vid Staffordshire and Worcestershire Canal -	39,963	5				
from Whittington to Fazeley - - -	3,615	5	415,273	16		
for supply of works in the mining district -			1,523,085	9	2,498,478	7
Total tons - -					2,498,478	7

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SYNOPSIS OF THE TONNAGES IN THE YEAR 1860.

	Tons.	Cwt.	Tons.	Cwt.	Total.	
COAL, for supply of Birmingham			640,201	5		
vid Worcester Canal	166,362	12				
vid Warwick Canal	83,914	—				
vid Coventry Canal	858	10				
vid Staffordshire and Worcestershire Canal	8,509	—				
from Whittington to Fazeley	1,922	5	261,566	7		
for supply of works in the mining district			2,613,598	—	3,515,365	12
Total tons					3,515,365	12

SYNOPSIS OF THE TONNAGES IN THE YEAR 1866.

	Tons.	Cwt.	Tons.	Cwt.	Total.	
COAL, for supply of Birmingham			673,407	15		
vid Worcester Canal	135,585	—				
vid Warwick Canal	77,205	—				
vid Coventry Canal	517	10				
vid Staffordshire and Worcestershire Canal	13,776	10				
from Whittington to Fazeley	1,039	—	228,123	—		
for supply of works in the mining district			2,700,090	13	3,601,621	8
Total tons					3,601,621	8

APPENDIX, TABLE No. 94.

SHIPMENTS of COAL from GLOUCESTER since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	85,963	330	86,293
1852	88,801	428	89,229
1853	92,723	38	92,761
1854	78,609	414	79,023
1855	112,197	210	112,407
1856	94,763	2,525	97,288
1857	109,210	1,825	111,035
1858	133,719	4,719	138,438
1859	137,811	1,692	139,503
1860	157,627	6,355	163,982
Total	1,091,423	18,536	1,109,959
1861	161,289	4,563	165,852
1862	163,148	6,550	166,698
1863	168,188	1,109	169,297
1864	169,924	2,180	172,104
1865	169,265	1,485	170,750
1866	173,755	1,892	175,647
1867	160,661	1,440	162,121
1868	170,979	880	171,859
1869	163,571	411	163,782
1870	..	..	..
Total for 9 years	1,497,600	20,510	1,518,110

APPENDIX, TABLE No. 95.

SHIPMENTS of COAL from BRISTOL since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	1,562	9,965	11,527
1852	1,085	9,965	11,050
1853	300	9,634	9,934
1854	2,333	11,102	13,435
1855	2,495	6,825	9,320
1856	1,197	10,465	11,662
1857	1,469	13,555	15,024
1858	1,091	10,993	12,084
1859	1,806	10,217	12,023
1860	674	10,223	10,897
Total	14,002	102,944	116,946
1861	876	17,594	18,470
1862	..	5,791	5,791
1863	422	4,349	4,771
1864	252	10,944	11,196
1865	263	10,085	10,348
1866	378	10,566	10,944
1867	995	5,257	6,252
1868	906	12,320	13,226
1869	..	9,574	9,574
1870	..	..	..
Total for 9 years	4,094	86,480	90,574

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Appendix No. 96.

List of Anthracite Collieries.

(Commencing at the top of the Neath Valley, and following the North Crop downwards to Kidwelly, from East to West.)

1. Maesmarchog Colliery:—Lessees, Messrs. Penrose and Starbuck. Manager, Mr. John Brown, agent to Messrs. Penrose and Starbuck, coal merchants, Neath.—Semi-anthracite.

2. Aberpergwm Colliery:—Owner and worker, Morgan Williams, Esq., Aperpergwm, near Neath.—Semi-anthracite.

3. Pwllffaron Colliery:—Owner, Morgan Williams, Esq. Lessees, the Neath Abbey Coal Company, near Neath. Manager, Mr. W. H. Bell, Drumma House, near Neath.—Semi-anthracite.

4. Ynisarwood Colliery:—Lessees, T. C. Hinde and Co., Ynisarwood Colliery, near Neath.—Semi-anthracite, and is worked as culm.

5. Cadoxton Colliery:—Lessees, Messrs. Evans and Bevan, Cadoxton, near Neath.—Semi-anthracite.

6. Ffoch-y-garren or Clynthynog Colliery:—The Glyneath Steam Coal Company. Manager, David Llewellyn, Esq., C.E., Pontypool.—Part steam and part semi-anthracite.

7. Glynybont Colliery:—Trustees of late Anthony Hall, Esq. Acting trustee, David Joseph, Esq., Ely Rise, near Cardiff.—Semi-anthracite. Not at work.

8. Cwmyrach Old Level:—Abandoned many years. John Arthur, Esq., lessee.—Semi-anthracite.

9. Cwmyrach or Venallt Colliery:—Owner and worker, late N. V. Edwards Vaughan, Esq. Agent, Mr. Henry Morgan, Pwllywaun Colliery, near Pontypridd.—Semi-anthracite.

10. Crinant Colliery:—Lessees, Messrs. Evans and Bevan, Cadoxton, near Neath.—Semi-anthracite. (Note.—Same lessees as No. 5.)

11. The Onllwyn Colliery:—The Onllwyn Iron Company. (Abandoned some years.)—Semi-anthracite.

12. Gwannclawdd Colliery:—The Ystalyfera Iron Company. Manager, Robert C. Fisher, Esq., Ystalyfera Iron Works, near Swansea.—Good anthracite.

13. The Ynisbydafa Colliery:—Captain De Winton, owner and worker. Agent, Mr. David Griffiths, "Castle Inn," Ystradgunlais, Swansea Valley.—Anthracite.

14. Ystalyfera Iron Company's Collieries:—The Ystalyfera Iron Company. Manager, Robert C. Fisher, Esq., Ystalyfera Iron Works, near Swansea.—Good anthracite. (Note.—Same lessees as No. 12.)

15. Yniscedwyn Iron Company's Collieries:—The Yniscedwyn Iron Company, Yniscedwyn Iron Works, near Swansea.—Good anthracite.

16. Ynisygeinon Colliery:—The Ynisygeinon Coal Company. Manager, Mr. Ingram, Wind Street, Swansea.—Semi-anthracite.

17. Ynismedw Colliery:—Owner, Iltid Thomas, Esq., Glanmôr, near Swansea.—Semi-anthracite.

18. The Palleg Colliery:—Henry Pratt, Esq., Star Colliery, near Kidwelly.—Anthracite.

19. The Brynmorgan Colliery:—The Yniscedwyn Iron Company, Yniscedwyn Iron Works, near Swansea.—Anthracite. (Note.—Same lessees as No. 15.)

20. The Ystradowen Colliery:—Lessees, Messrs. Carr. Abandoned some years. Landlord's agent, E. Daniel, Swansea.—Anthracite.

21. The Cwmllynfell Colliery:—Lessees, Messrs. Brock and Son (late James and Aubrey), coal merchants, Swansea.—Anthracite.

22. The Twynadam Colliery:—Lessee, Mr. R. B. Williams, Melmtrythan, near Neath.—Anthracite.

23. The Brynamman Collieries:—The Brynamman Iron Company. Manager, Mr. Henry Richards, Brynamman Iron Works, near Llanelly.—Best anthracite.

24. The Llwynrhidia Colliery:—Mr. Joseph Thomas, Prospect Place, Cwmamman, Llanelly.—Good anthracite.

25. The Wauncaegurwen Colliery:—Messrs. Richard Morgan and Son, coal merchants, New Dock, Llanelly.—Best anthracite.

26. The Garnant Collieries:—Lessees, R. Perkins and Company. (Abandoned some years.) Landlord's agent, William Rosser, Esq., Llanelly.—Best anthracite.

27. The Raven Collieries:—Lessees, Messrs. Jones and Company. Manager, Mr. John Dowle Jones, Temple Street, Swansea.—Best anthracite.

28. The Gellygedrim Colliery:—Executors of late Joseph Martin, Esq. (Shut up at present.) Landlord's agent, E. Daniel, Swansea.—Best anthracite.

29. The Tregloin Colliery:—Executors of late Joseph Martin, Esq. (Shut up at present.) Landlord's agent, E. Daniel, Swansea.—Best anthracite.

30. The Brinlloi Colliery:—Messrs. Richards and Strick. Manager, Mr. Henry Richards, Brynamman Iron Works, near Llanelly.—Best anthracite.

31. The Tyllwyd Colliery:—Mr. William Jones, Tyllwydd Colliery, Cwmamman, Llanelly.—Good anthracite.

32. The Cawdor Colliery:—Lessees, Messrs. Morgan and Thompson, Llanelly. Address, R. G. S. Thompson, Esq., Grove Place, Swansea.—Semi-anthracite, good.

33. The Llwynyrhaf Colliery:—John Biddulph, Esq., Swansea. (Abandoned.)—Best anthracite.

34. The Glynmoch Colliery:—David Lloyd and Son, Pantyffynon Collieries, near Llanelly.—Semi-anthracite.

35. The Garn Colliery:—Messrs. Harries, Techon Colliery, near Llanelly. Just opened.—Semi-anthracite.

36. The Pantyffynon Colliery:—David Lloyd and Sons, Pantyffynon Colliery, near Llanelly.—Good anthracite. (Note.—Same lessee as No. 34.)

37. The Rhôs Colliery:—Benjamin Jones, Esq., Rhos Colliery, Llanelly.—Good anthracite.

38. Pwll-y-Lord Colliery:—David Lloyd and Sons, Pantyffynon Colliery, near Llanelly.—Good anthracite.—(Note.—Same lessee as Nos. 34 and 36.)

39. Cottage Hall Colliery:—The Cottage Hall Colliery Company, Cottage Hall Colliery, Llandibie, near Llanelly.—Good anthracite.

40. Gorse Goch Colliery:—Benjamin Jones, Rhôs Colliery, Llanelly.—Best anthracite. (Note.—Same lessee as No. 37.)

41. Cross Hands Collieries:—Messrs. Norton and Company, Cross Hands Colliery, near Llanelly.—Best anthracite.

42. Cwmmawr Colliery:—Messrs. Thomas. The Rev. D. Parry Thomas, Rectory, near Cowbridge.—Best anthracite.

43. The Gwendraeth Colliery:—Messrs. Watney and Company, Gwendraeth Iron Works, near Carmarthen, Manager, Mr. William Harries, Gwendraeth Iron Works, near Carmarthen.—Best anthracite.

44. The Glangwendraeth Colliery:—William Evans, Esq., Glangwendraeth Colliery, Pontyeats, near Carmarthen. Manager, Mr. W. Evans.—Best anthracite.

45. The Plasbach Colliery:—Owner, R. A. Mansel, Esq. (Abandoned some years.)—Best anthracite.

46. The Carway Colliery:—The Carway Coal Company. Agent, Mr. Elias Richards, Carway Colliery, near Kidwelly.—Best anthracite.

47. The Trimsaron Collieries:—The Trimsaron Iron Company. (Abandoned many years.)—Some anthracite and semi-anthracite.

48. The Star Colliery:—Henry Pratt, Esq., the Star Colliery, near Kidwelly.—Semi-anthracite. (Note.—Same lessee as No. 18.)

List of Collieries, and Lessees, in Pembrokeshire.

1. Ainkell, Redbath, and Bolton Hill Collieries, Haverfordwest.—John Williams.
2. Bonville Court Works, Haverfordwest.—Messrs. Myers and Company.
3. Broadmoor, Haverfordwest.—Messrs. The Bodmoor Anthracite Coal Company.
4. Broadhaven Slash Colliery, Haverfordwest.—Messrs. Thomas and Canton.
5. Cardmakers Pool Colliery, Haverfordwest.—Enoch Barrah.
6. Freystrop Colliery, Haverfordwest.—Sir John Pakington.
7. Hook Colliery, Haverfordwest.—Thomas Harcourt Powell.
8. Kilgetty Works, Tenby.—Messrs. Vickerman and Company.
9. Killawn Colliery, Tenby.—Henry Saunders.
10. Landshipping Colliery, Haverfordwest.—Messrs. Stanley and Talbot
11. Moreton Colliery, Tenby.—Messrs. The Moreton Colliery Company.
12. Nolton Colliery, Haverfordwest.—John Barrah.
13. Shipping Colliery, Tenby.—Joseph Cadman.
14. Southwood Colliery, Haverfordwest.—Messrs. Walters and Canton.
15. Thomas Chapel Works, Tenby.—Messrs. The Pembrokeshire Iron and Coal Company.
16. Thomas Hill Colliery, Tenby.—Thomas Thomas.

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Appendix, Table No. 97.

Coal raised in the Parish of Aberdare for Twelve Months ending December 1869.

Names of Owner.	Name of Colliery.	Exported.	Used at Iron Works.	Total.	Increase on previous Year.	Decrease on previous Year.
		Tons.	Tons.	Tons.	Tons.	Tons.
Hirwain Coal and Iron Company	Park Pit	20,323	—	20,323	—	28,879
Aberdare Merthyr Steam Coal Company	Hirwain*	30,609	—	30,609	—	48,741
London and Merthyr Steam Coal Company	Cefn, Merthyr	56,523	—	56,523	17,712	—
Powell and Rhys	Graig	7,685	—	7,685	—	2,114
Rhydywain Coal Company	Rhydywain	4,098	—	4,098	2,092	—
Bwllfa Colliery Company	Bwllfa	103,823	—	103,823	—	429
Mordecai Jones	Nantmelyn	98,023	—	98,023	19,299	—
Rhys and Richards	Merthyr Dare	44,111	—	44,111	5,707	—
Gadlys Iron Company	Gadlys	107,085	10,563	117,648	7,656	—
Samuel Thomas	Sguborwen	86,208	—	86,208	4,008	—
Aberdare Iron Company	Abernant	188,668	62,491	251,159	19,983	—
Heath, Evens, and Company	Werfa	55,629	—	55,629	—	1,966
Aberdare Coal Company	Abernant-y-Groes	94,691	—	94,691	—	6,494
Lletty Shenkin Coal Company	Lletty Shenkin	84,871	—	84,871	—	3,868
Nixon, Taylor, and Cory	Deep Duffryn	111,975	—	111,975	285	—
Powell Duffryn Steam Coal Company	High Duffryn	6,213			5,858	—
Ditto	Upper Duffryn	11,601			—	2,687
Ditto	Old Duffryn	32,615			161	—
Ditto	Middle Duffryn	134,493			8,906	—
Ditto	Lower Duffryn	210,503			9,154	—
Ditto	Cwmdare	44,902	—	738,068	9,402	—
Ditto	Aberawawr	76,685			9,307	—
Ditto	Aberaman	54,062			31,004	—
Ditto	Cwmneol	62,672			—	9,418
Ditto	Pforchaman	104,343			—	7,573
D. Davis and Sons	Blaengwawr	56,157	—	146,567	10,602	—
Ditto	Aberawmboy	90,410			24,402	—
Cwmaman Aberdare Merthyr Steam Coal Company	Cwmaman	79,411	—	79,411	8,402	—
Kenway and Son	Bedlwyn	10,203	—	10,203	5,292	—
		2,068,570	73,054	2,141,624	199,314	111,199

Increase on previous Year - - - 88,115 Tons.

	Tons.
Coal worked in the Hamlet of Rhigos, but brought to bank in the Parish of Aberdare—Hirwain Coal and Iron Company—Bute Pit	32,675
Coal worked in the Parish of Llanwonno, but brought to bank in the Parish of Aberdare—Nixon, Taylor, and Cory—Deep Duffryn	20,301
Total	52,976

* Ceased working, June 1869.

Appendix, Table No. 98.

Return of Coal raised in the Parish of Llanwonno, County of Glamorgan, for Twelve Months ending December 1869.

No. of Colliery.	Name of Colliery.	Coal, how chiefly disposed of.	1st Quarter, ended March 25th.	2nd Quarter, ended June 30th.	3rd Quarter, ended Sept. 30th.	4th Quarter, ended Dec. 31st.	Total of each Colliery for the Year.	Grand Total for the Year.	Remarks.
			Tons	Tons.	Tons.	Tons.	Tons.	Tons.	
1	Navigation Colliery	Exported, Steam	26,842	37,706	31,921	34,810	131,279	—	
2	Deep Duffryn Colliery	Ditto	4,759	5,815	4,594	4,504	19,672	—	
3	Pont Cynon Colliery	Inland, House	531	360	426	410	1,727	—	
4	Llwyncelyn Colliery	Ditto	5,649	6,552	7,100	6,014	25,315	—	
5	Hafod Colliery	Ditto	—	—	—	—	—	—	
6	Gyfeillon or Great Western Colliery	Inland and Exported, House	13,458	17,746	14,290	22,195	67,689	—	Llantrisant, Wayleave.
7	Darranddu Colliery	—	—	—	—	—	—	—	
8	Dualit Colliery	Inland, House	50	50	50	50	200	—	
9	New Darrenddu Colliery	Export, &c. House	3,977	3,592	4,563	3,681	15,813	—	
10	Ferndale Colliery	Exported, Steam	11,565	10,143	3,000	9,514	34,522	—	
"	Ditto	Ditto	21,683	16,604	2,744	11,449	52,480	—	Ystrad, Wayleave.
11	Carne Park Colliery	Inland, &c. House	753	—	—	—	753	—	
12	Ynyshir Colliery	Export, &c. House	6,629	6,146	8,084	8,862	29,721	—	
	Total		95,896	104,714	76,771	101,789	—	379,170	
			Decrease on the year 1868					6,669	

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Appendix, Table No. 99.

Return of Coal raised in the Parish of Gelligaer, during the Years 1867 and 1868.

Name of Owner.	Situation of Collieries.	1867.	1868.	Increase.	Decrease.
		Tons.	Tons.	Tons.	Tons.
Dowlais Iron Company	Senghenydd Common	182,711	196,629	13,918	—
Ditto	Raised through Pits in Merthyr Parish	42,192	30,416	—	11,176
Ditto	Exported	78,903	147,381	68,478	—
Rymney Iron Company	Senghenydd Common	64,595	63,570	—	1,025
Ditto	Exported	10,097	8,977	—	1,120
Ditto	Graig Rhymney	19,218	19,679	461	—
Ditto	Tir Phil	15,346	2,893	—	12,453
Ditto	Tir Phil Pit	100,093	64,489	—	35,604
Charles Hollwey and Company	Troedyrhiwfuwch	10,844	7,394	—	3,450
Powell's Duffryn Steam Coal Company	New Tredegar	19,456	33,306	13,850	—
Thomas Joseph and Company	New Brithdir	50,704	25,301	—	25,403
P. T. Woodruff	Old Brithdir	27,083	21,075	—	6,008
Richard Jones and Company	Dery Newydd	19,962	11,129	—	8,833
Bargoed Coal Company	Cil Haul	17,313	22,419	5,106	—
Ditto	Cwmllwydrew	17,163	663	—	16,500
Thomas Powell	Gelliargwellt	21,608	20,605	—	1,003
Ditto	Penallta	9,192	6,635	—	2,557
W. and E. Beddoe	Penallta Level	—	4,215	4,215	—
G. S. Worthington	Llancaiach	50,382	41,396	—	8,986
W. S. Cartwright	Tophill	18,846	10,573	—	8,273
Joseph Latch and Cope	Glanddu	15,433	—	—	15,433
William Jones	Pentrepoeth	1,014	—	—	1,014
R. Lewis and E. Jenkins	Cefn Llwynau	12,104	5,598	—	6,506
Charles Protheroe	Church Pit	6,700	2,946	—	3,754
Ditto	New Place	24,910	13,603	—	11,307
Carngethin Coal Company	Rose Pit	8,500	10,657	2,157	—
Edmund D. Williams	Glyngaer	6,537	5,844	—	693
Richard Evans	Pottery	2,092	2,053	—	39
Christopher James	Glwadis	26,610	20,966	—	5,644
George Batters	Cilfachfargoed	11,370	7,012	—	4,358
	Total	891,578	807,424	108,185	192,339

Decrease on previous Year - - - 84,154 Tons.

	Tons.
Coal worked in the Parish of Merthyr, but brought to bank in the Parish of Gelligaer, Dowlais Iron Company, Vochriw Pits	45,902
Coal worked in the Parish of Llanvabon, but brought to bank in the Parish of Gelligaer, Thomas Powell, Gelliargwellt Pit	8,156
Coal worked in the Parish of Llanvabon, but brought to bank in the Parish of Gelligaer, Penallta Pit	3,719
Total	57,777

Appendix, Table No. 100.

Return of Coal raised in the Parish of Gelligaer, for Twelve Months ending December 1869.

Name of Owner.	Situation of Collieries.	Exported.	Used at Iron Works.	Total.	Increase on previous Year.	Decrease on previous Year.
		Tons.	Tons.	Tons.	Tons.	Tons.
Dowlais Iron Company	Senghenydd Common	129,359	218,354	347,713	3,703	—
Ditto	Raised through Pits in Merthyr Parish	—	39,000	39,000	8,584	—
Rhymney Iron Company	Senghenydd Common	13,414	80,173	93,587	21,049	—
Ditto	Graig Rhymney	352	11,952	12,304	—	7,375
Ditto	Tir Phil Pit	15,920	59,764	75,684	11,195	—
Ditto	Darren Pit	38	457	495	495	—
Charles Hollwey and Company	Troedyrhiwfuwch	7,743	—	7,743	349	—
Powell's Duffryn Steam Coal Company	New Tredegar	44,284	—	44,284	10,978	—
P. T. Woodruff	Old Brithdir	31,853	—	31,853	10,778	—
Richard Jones and Company	Dery Newydd	24,653	—	24,653	13,524	—
Bargoed Coal Company	Cil Haul	49,439	—	49,439	27,020	—
Executors of the late Thomas Powell	Gelliargwellt	780	—	7,610	—	19,325
Ditto	Penallta	6,830	—		195	—
William and E. Beddoe	Penallta Level	10,653	—	10,653	6,438	—
G. S. Worthington	Llancaiach	47,837	—	47,837	6,441	—
W. S. Cartwright	Tophill	13,127	—	13,127	2,554	—
Joseph Latch and Cope	Glanddu	1,294	—	1,294	1,294	—
R. Lewis and E. Jenkins	Cefn Llwynau	8,783	—	8,783	3,185	—
Charles Prothero	Church Pit	4,265	—	18,463	1,319	—
Ditto	New Place	14,198	—		595	—
Carngethin Coal Company	Rose Pit	16,759	—	16,759	6,102	—
Edmund D. Williams	Glyngaer	6,293	—	6,293	440	—
Christopher James	Gwladis	29,156	—	29,156	8,190	—
George Batters	Cilfachfargoed	9,388	—	9,388	2,376	—
	Total	486,418	409,700	896,118	146,804	27,200

Increase on previous Year - - - - 112,604 Tons.

	Tons.
Coal worked in the Parish of Merthyr, but brought to bank in the Parish of Gelligaer, Dowlais Iron Company, Vochrhiw Pits	43,412
Coal worked in the Parish of Merthyr, but brought to bank in the Parish of Gelligaer, Dowlais Iron Company, Pantywaun Pit	16,900
Coal worked in the Parish of Llanvabon, but brought to bank in the Parish of Gelligaer, Executors of the late Thomas Powell, Gelliargwellt Pit	16,335
Coal worked in the Parish of Llanvabon, but brought to bank in the Parish of Gelligaer, Executors of the late Thomas Powell, Penallta Pit	10,800
Total	87,447

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Appendix, Table No. 101.

An Account of Coal raised in the Parish of Ystradyfodwg for the Twelve Months ending December 1869.

No.	Names of Collieries.	1866.	1867.	1868.	Total of each Colliery for the Year 1869.
		Tons cwts.	Tons cwts.	Tons cwts.	Tons cwts.
1	Dunraven	35,159 20	59,395 16	92,497 9	86,396 7
2	Rhondda Merthyr	—	—	—	40,655 20
3	Bute Merthyr	—	—	—	53,737 3
4	Ynysfaio	29,094 17	37,246 6	20,253 0	20,478 2
5	Aberorki	51,051 12	81,130 8	73,234 19	109,030 11
6	Tylacoch	2,821 5	13,054 9	17,443 12	16,564 20
7	Ocean Steam	—	—	—	204,539 14
8	Pentre	43,386 4	58,244 7	59,263 12	49,786 15
9	Church	28,157 3	18,744 4	26,686 9	22,399 6
10	Bodryngallt	42,666 9	41,721 3	42,585 14	28,818 9
11	Bwllfa	31,387 20	44,243 14	41,147 20	51,871 20
12	Blaenclydach	21,189 15	21,283 9	22,152 7	10,388 1
13	Cwmclydach	44,136 2	38,765 2	37,977 6	48,298 18
14	Llwynypia	31,380 8	45,207 11	41,130 3	43,446 5
15	Gilvach-Goch	10,521 0	22,730 7	20,993 6	19,091 1
16	Penygraig	44,928 19	49,782 7	57,916 2	69,277 9
17	Adare	—	9,895 11	12,868 6	26,173 18
18	Dinas	47,507 8	41,334 19	49,808 17	47,848 11
19	Troedyrhiw	44,640 0	41,651 14	34,123 18	39,727 15
20	Ynyshir	20,790 0	4,383 12	23,918 13	29,720 15
21	Fern Dale	51,717 2	56,671 19	81,567 2	52,480 3
22	Tynewydd	16,184 7	23,183 18	33,163 17	—
23	Cwm Saibren	38,285 16	48,221 7	56,714 15	—
24	Gelligaled	4,877 12	—	—	—
25	Park and Mawindy	8,890 12	73,349 20	130,302 7	—
	Total	649,328 18	827,271 13	981,787 4	1,070,731 13
		—	649,328 18	827,271 13	981,787 4
	Increase on previous Year	—	177,426 16	‡ 154,515 12	88,944 9

Appendix, Tables No. 102.

Table I.—Showing the Economic Values of the Welsh Coals.

Names of Coals employed in the Experiments.	Economic Evaporating Power or lbs. of Water evaporated from 212° by 1 lb. of Coal.	Weight of 1 Cubic Foot of the Coal as used for Fuel.	Space occupied by 1 Ton in Cubic Feet (Economic Weight).	Weight of Water evaporated from 212° by 1 Cubic Foot of Coal.	Rate of Evaporation or Number of lbs. of Water evaporated per Hour.
	A.	B. Lbs.	F.	I. Lbs.	K. Mean.
Aberaman Merthyr	10·75	48·9	45·80	525·67	..
Ebbw Vale	10·21	53·3	42·26	544·19	460·22
Thomas's Merthyr	10·16	53·0	42·26	538·48	520·8
Duffryn	10·14	53·22	42·09	540·12	409·32
Nixon's Merthyr	9·96	51·7	43·32	514·93	511·4
Binea	9·94	57·08	39·24	587·92	486·95
Bedwas	9·79	50·05	44·32	494·39	476·96
Hill's Plymouth Work	9·75	51·2	43·74	499·20	531·6
Aberdare Co's. Merthyr	9·73	49·3	45·43	479·68	489·5
Gadly Nine-feet Seam	9·56	54·8	40·87	523·88	517·3
Resolven	9·53	58·66	38·19	559·02	390·25
Mynydd Newydd	9·52	56·33	39·76	536·26	470·69
Abercarn	9·47	50·3	44·53	443·96	480·00
Anthracite, Jones & Co.	9 46	58·25	38·45	565·02	409·37
Ward's Fiery Vein	9·40	57·433	39·00	608·78	529·90
Neath Abbey	9·38	59·3	37·77	556·23	546·1
Graigola	9·35	60·166	37·23	581·20	441·48
Gadly Four-feet Seam	9·29	51·6	43·41	479·36	400·00
Machen Rock Vein	9·23	48·1	46·56	443·96	488·75
Birch Grove Graigola	9·22	51·0	43·92	470·22	507·50
Llynvi	9·19	53·3	42·02	429·82	399·50
Cadoxton	8·97	58·1	38·55	521·15	344·16
Oldcastle Fiery Vein	8·94	50·916	43·99	455·18	464·30
Vivian and Son's	8·92	47·9	46·76	427·26	421·25
Llangennech	8·86	56·93	39·34	523·75	373·22
Three-quarter Rock Vein	8·84	56·388	39·72	498·46	486·86
Pentrepoth	8·72	57·72	38·80	518·32	381·50
Cwm Frood Rock Vein	8·70	55·277	40·52	490·90	379·80
Cwm Nanty Gras	8·42	56·0	40·00	471·52	404·16
Brymbo Main	8·36	47·0	47·65	392·92	435·83
Vivian and Son's Rock Vawr	8·08	48·9	45·80	395·11	492·50
Coleshill	8·0	53·0	42·26	424·0	406·41
Brymbo Two Yard	7·85	47·9	46·76	376·00	441·66
Rock Vawr	7·68	55·0	40·72	422·40	397·5
Porth Mawr	7·53	53·3	42·02	401·34	347·44
Pontypool	7·47	55·7	40·216	416·07	250·40
Pentrefelin	6·36	66·166	33·85	489·62	247·24

Table II.—Showing the Mean Composition of Average Samples of the Welsh Coals.

Locality or Name of Coal.	Specific Gravity of Coals.	Carbon.	Hydrogen.	Oxygen.	Ash.	Per-centage of Coke left by each Coal.
	A.	B.	C.	F.	G.	K.
Aberaman Merthyr	1·305	90·94	4·28	0·94	1·45	85·0
Ebbw Vale	1·275	89·78	5·15	0·39	1·50	77·5
Thomas's Merthyr	1·30	90·12	4·33	2·02	1·66	86·53
Duffryn	1·336	88·26	4·66	0·60	3·26	84·3
Nixon's Merthyr	1·31	90·27	4·12	2·53	1·25	79·11
Binea	1·304	88·66	4·63	1·03	3·96	88·10
Bedwas	1·32	80·61	6·01	1·50	6·94	71·7
Hill's Plymouth Work	1·35	88·49	4·00	3·32	2·39	83·35
Aberdare Co's. Merthyr	1·31	88·28	4·24	1·65	3·26	85·83
Gadly Nine-feet Seam	1·33	86·18	4·31	2·21	5·34	86·54
Resolven	1·32	79·33	4·75	*	9·41	83·9
Mynydd Newydd	1·31	84·71	5·76	3·52	3·24	74·8
Abercarn	1·334	81·26	6·31	9·76	2·04	68·4
Anthracite, Jones & Co.	1·375	91·44	3·46	2·58	1·52	93·9
Ward's Fiery Vein	1·344	87·87	3·93	*	7·04	..
Neath Abbey	1·31	89·04	5·05	..	3·55	61·42
Graigola	1·30	84·87	3·84	7·19	3·24	85·5
Gadly Four-feet Seam	1·32	88·56	4·79	..	4·88	88·22
Machen Rock Vein	1·297	71·08	4·88	17·87	3·85	65·2
Birch Grove Graigola	1·360	84·25	4·15	5·58	4·43	85·1
Llynvi	1·28	87·18	5·06	2·53	3·04	72·94
Cadoxton	1·378	87·17	4·34	1·58	3·57	82·0
Oldcastle Fiery Vein	1·289	87·68	4·89	3·39	2·64	79·8
Vivian & Son's Merthyr	1·299	83·75	5·31	4·64	5·31	67·1
Llangennech	1·312	85·46	4·20	2·44	6·54	83·60
Three-quarter Rock Vein	1·34	75·15	4·93	5·04	10·96	62·5
Pentrepoth	1·31	88·72	4·50	3·24	3·36	82·5
Cwm Frood Rock Vein	1·255	82·25	5·84	3·58	6·09	66·8
Cwm Nanty Gras	1·28	78·36	5·59	5·58	5·60	65·6
Brymbo Main	1·300	77·87	5·09	9·52	4·22	55·4
Vivian & Son's Rock Vawr	1·301	79·09	5·20	8·34	4·30	58·6
Coleshill	1·29	73·84	5·14	8·29	8·92	56·0
Brymbo Two Yard	1·283	78·13	5·53	8·02	5·90	56·2
Rock Vawr	1·29	77·98	4·39	8·55	7·55	62·50
Porth Mawr	1·39	74·70	4·79	3·60	14·72	63·1
Pontypool	1·33	80·70	5·66	4·38	5·52	64·8
Pentrefelin	1·358	85·52	3·72	4·55	6·09	55·0

Nitrogen and sulphur omitted, as being unimportant to this inquiry.
* Included in Ash.

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TABLE III.—Showing the ECONOMIC VALUES of the NEWCASTLE COALS.

Names of Coals employed in Experiments.	Evaporating Power or Number of lbs. of Water evaporated from 212° by 1 lb. of Coal.	Weight of 1 Cubic Foot of the Coal as used for Fuel.	Space occupied by 1 Ton in Cubic Feet (Economic Weight).	Weight of Water evaporated from 212° by 1 Cubic Foot of Coal.	Rate of Evaporation or Number of lbs. of Water evaporated per Hour.
	A.	B. Lbs.	F.	I. Lbs.	K. Mean.
Willington - -	9·95	53·2	42·10	529·34	..
Andrews House Tanfield	9·89	52·1	42·99	489·21	351·2
Bowden Close - -	9·38	50·6	44·26	474·62	..
Haswell Wallsend -	8·87	47·4	47·25	420·48	411·66
Newcastle Hartley -	8·23	50·5	44·35	415·61	308·0
Hedley's Hartley -	8·16	53·0	42·07	424·32	300·8
Bates' West Hartley -	8·04	50·8	44·13	408·43	406·8
West Hartley Main -	7·87	48·9	45·80	394·84	457·50
Buddle's West Hartley	7·82	50·6	44·60	395·69	413·3
Hastings' Hartley -	7·77	48·5	46·18	376·84	404·5
Carr's Hartley - -	7·71	47·8	46·86	368·53	344·3
Davison's West Hartley	7·61	47·7	46·96	362·99	402·9
North Percy Hartley -	7·57	49·1	45·62	371·68	423·5
Haswell Coal Co's. Steamboat Wallsend	7·48	49·5	45·25	370·66	291·8
Derwentwater Hartley	7·42	50·4	44·44	373·96	451·1
Broomhill - -	7·3	52·5	42·67	383·25	397·78
Original Hartley -	6·82	49·1	45·62	384·86	423·4
Cowpen and Sidney's Hartley - - -	6·79	47·9	46·76	325·24	350·4

TABLE IV.—Showing the MEAN COMPOSITION of Average Samples of the NEWCASTLE COALS.

Locality or Name of Coal.	Specific Gravity of Coals.	Carbon.	Hydrogen.	Oxygen.	Ash.	Per-centage of Coke left by each Coal.
	A.	B.	C.	F.	G.	H.
Willington - -	..	86·81	4·96	5·23	1·08	72·19
Andrews House Tanfield	1·26	85·58	5·31	4·39	2·14	65·18
Bowden Close - -	..	84·92	4·53	6·66	2·28	69·69
Haswell Wallsend -	1·286	83·47	6:68	8·17	0·20	62·70
Newcastle Hartley -	1·29	81·81	5·50	2·58	7·14	64·61
Hedley's Hartley -	1·31	80·26	5·28	2·40	9·12	72·31
Bates' West Hartley -	1·25	80·61	5·26	6·51	4·25	..
West Hartley Main -	1·264	81·85	5·29	7·53	2·51	59·20
Buddle's West Hartley	1·23	80·75	5·04	7·86	3·85	..
Hastings' Hartley -	1·25	82·24	5·42	6·44	2·94	35·60
Carr's Hartley - -	1·25	79·83	5·11	7·86	5·21	60·63
Davison's West Hartley	1·25	83·26	5·31	2·50	5·84	59·49
North Percy Hartley -	1·23	80·03	5·06	9·91	3·22	57·18
Haswell Coal Co's. Steamboat Wallsend	1·27	83·71	5·30	2·79	5·93	61·38
Derwentwater Hartley	1·26	78·01	4·74	10·31	3·73	54·83
Broomhill - -	1·25	81·70	6·17	4·37	3·07	59·20
Original Hartley -	1·25	81·18	5·56	8·06	3·07	58·22
Cowpen and Sidney's Hartley - -	1·26	82·20	5·10	7·97	2·33	58·59

Nitrogen and sulphur omitted, as being unimportant to this inquiry.

TABLE V.—Showing the ECONOMIC VALUE of certain DERBYSHIRE COALS.

Names of Coals employed in Experiments.	Economic Evaporating Power or lbs. of Water evaporated from 212° by 1 lb. of Coal.	Weight of 1 Cubic Foot of the Coal as used for Fuel.	Space occupied by 1 Ton in Cubic Feet (Economic Weight).	Weight of Water evaporated from 212° by 1 Cubic Foot of Coal.	Rate of Evaporation or Number of lbs. of Water evaporated per Hour.
	A.	B. Lbs.	F.	I. Lbs.	K. Mean.
Earl Fitzwilliam's Elsecar - - -	8·53	47·2	47·45	402·14	412·70
Hoyland & Co.'s Elsecar	8·07	48·2	46·47	388·97	372·91
Earl Fitzwilliam's Park Gate - - -	7·92	47·0	47·65	372·24	393·75
Butterley Co.'s Portland	7·92	47·1	47·55	373·03	487·08
Butterley Co.'s Langley	7·80	47·8	46·86	372·84	398·69
Staveley - -	7·26	49·9	44·88	363·27	466·2
Loscoe Soft - -	6·88	44·8	50·00	308·22	499·06
Loscoe Hard - -	6·32	45·9	48·80	290·08	431·42

TABLE VI.—Showing the MEAN COMPOSITION of Average Samples of certain DERBYSHIRE COALS.

Locality or Name of Coal.	Specific Gravity of Coal.	Carbon.	Hydrogen.	Oxygen.	Ash.	Per-centage of Coke left by each Coal.
	A.	B.	C.	F.	G.	H.
Earl Fitzwilliam's Elsecar - - -	1·296	81·93	4·85	8·58	2·46	61·6
Hoyland & Co.'s Elsecar	1·317	80·05	4·93	8·99	3·73	62·5
Earl Fitzwilliam's Park Gate - - -	1·311	80·07	4·93	9·95	1·80	61·7
Butterley Co.'s Portland	1·301	80·41	4·65	11·26	1·23	60·9
Butterley Co.'s Langley	1·264	77·97	5·58	9·56	4·65	54·9
Staveley - - -	1·27	79·85	4·84	10·96	2·40	57·86
Loscoe Soft - -	1·285	77·49	4·86	12·41	2·30	52·8

Nitrogen and sulphur omitted, as being unimportant to this inquiry.

TABLE VII.—Showing the ECONOMIC VALUES of the LANCASHIRE COALS.

Names of Coals employed in the Experiments.	Economic Evaporating Power or Number of lbs. of Water evaporated from 212° by 1 lb. of Coal.	Weight of 1 Cubic Foot of the Coal as used for Fuel.	Space occupied by 1 Ton in Cubic Feet (Economic Weight).	Weight of Water evaporated from 212° by 1 Cubic Foot of Coal.	Rate of Evaporation or Number of lbs. of Water evaporated per Hour.
	A.	B. Lbs.	F.	I. Lbs.	K. Mean.
Ince Hall Co.'s Arley -	9·47	47·6	47·05	455·06	487·29
Haydock Little Delf -	9·13	44·9	49·88	409·93	532·91
Balcarre's Arley -	8·83	50·5	44·35	445·91	454·1
Blackley Hurst - -	8·81	48·0	46·66	422·88	500·8
Ince Hall Pemberton Yard - - -	8·78	48·0	46·66	421·44	461·25
Haydock Rushy Park -	8·74	49·3	45·48	430·88	461·66
Moss Hall Pemberton Four Feet - -	8·52	47·3	47·35	402·99	480·00
Haydock Higher Florida	8·39	49·5	45·25	415·30	467·50
Ince Hall Pemberton Four Feet - -	8·34	51·8	43·24	432·01	497·39
Blackbrook Little Delf	8·29	51·0	43·92	422·79	440·4
King - - - -	8·17	50·8	44·09	415·03	395·41
Rushy Park Mine -	8·08	47·0	47·65	379·76	419·1
Blackbrook Rushy Park	8·02	55·3	40·50	443·50	481·2
Johnson and Wirthington's Rushy Park	8·01	50·0	44·80	400·50	454·5
Laffak Rushy Park -	7·98	52·6	42·58	419·74	435·0
Balcarre's Haigh Yard	7·90	50·8	44·13	401·32	398·3
Haydock Florida Main	7·83	48·0	46·66	375·84	422·50
Wigan Four Feet -	7·77	53·4	41·94	414·91	414·79
Ince Hall Pemberton Five Feet - -	7·72	51·8	43·24	399·89	495·20
Cannel (Wigan) -	7·70	48·3	46·37	371·91	381·1
Ince Hall Co.'s Furnace Vein - -	7·47	49·3	45·48	368·27	435·21
Balcarre's Lindsay -	7·44	51·1	43·83	380·18	431·5
Caldwell & Thompson's Rushy Park - -	7·34	47·5	47·15	348·65	449·79
Balcarre's Five Feet -	7·21	49·0	45·71	353·29	489·5
Moss Hall Pemberton Five Feet - -	7·13	48·3	46·37	344·37	417·18
Moss Hall Co.'s New Mine - - -	7·04	48·4	46·28	340·73	422·08
Caldwell & Thompson's Higher Delf - -	6·93	48·4	46·28	331·54	434·28
Johnson and Wirthington's Sir John - -	6·32	51·6	43·41	326·11	360·7

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TABLE VIII.—Showing the MEAN COMPOSITION of Average Samples of the LANCASHIRE COALS.

Locality or Name of Coal.	Specific Gravity of Coal.	Carbon.	Hydrogen.	Oxygen.	Ash.	Per-centage of Coke left by each Coal.
	A.	B.	C.	F.	G.	H.
Ince Hall Co.'s Arley	1·272	82·61	5·86	7·44	1·53	64·0
Haydock Little Delf	1·257	79·71	5·16	10·65	3·48	58·1
Balcarre's Arley	1·26	83·54	5·24	5·87	3·32	62·89
Blackley Hurst	1·26	82·01	5·55	5·28	4·05	57·84
Ince Hall Pemberton Yard	1·348	80·78	6·23	7·53	2·34	60·6
Haydock Rushy Park	1·323	77·65	5·53	10·91	3·68	59·4
Moss Hall Pemberton Four Feet	1·253	75·53	4·83	7·98	6·58	55·7
Haydock Higher Florida	1·218	77·33	5·56	12·02	3·05	51·1
Ince Hall Pemberton Four Feet	1·276	77·01	3·93	5·52	1·09	57·1
Blackbrook Little Delf	1·26	82·70	5·55	4·89	4·31	58·48
King	1·300	73·66	5·30	9·06	8·72	62·4
Rushy Park Mine	1·28	77·76	5·23	8·99	5·69	56·66
Blackbrook Rushy Park	1·27	81·16	5·99	7·20	2·68	58·10
Johnson & Wirthington's Rushy Park	1·28	79·50	5·15	9·24	2·19	57·52
Laffak Rushy Park	1·35	80·47	5·72	8·33	2·82	56·26
Balcarre's Haigh Yard	1·28	82·26	5·47	5·64	3·90	66·09
Haydock Florida Main	1·297	77·49	5·50	12·84	2·02	54·4
Wigan Four Feet	1·209	78·86	5·29	9·57	4·23	60·0
Ince Hall Pemberton Five Feet	1·269	68·72	4·76	18·63	14·34	56·5
Cannel (Wigan)	1·23	79·23	6·08	7·24	4·84	60·33
Ince Hall Co.'s Furnace Vein	1·314	74·74	5·71	13·52	4·04	58·4
Balcarre's Lindsay	1·26	83·90	5·66	5·53	2·00	57·84
Caldwell & Thompson's Rushy Park	1·271	76·17	5·46	14·87	1·50	58·7
Balcane's Five Feet	1·26	74·21	5·03	8·69	9·21	55·90
Moss Hall Pemberton Five Feet	1·283	76·16	5·35	10·13	6·02	56·1
Moss Hall Co.'s New Mine	1·278	77·50	4·84	12·16	3·16	57·7
Caldwell & Thompson's Higher Delf	1·274	75·40	4·83	19·98	5·95	54·2
Johnson & Wirthington's Sir John	1·31	72·86	4·98	8·15	11·40	56·15

Nitrogen and sulphur omitted, as being unimportant to this inquiry.

TABLE IX.—Showing the MEAN COMPOSITION of Average Samples of VARIOUS COALS.

Locality or Name of Coal.	Specific Gravity of Coals.	Carbon.	Hydrogen.	Oxygen.	Ash.	Per-centage of Coke left by each Coal.
	A.	B.	C.	F.	G.	H.
Scotch Coals:						
Wallsend Elgin	1·20	76·09	5·22	5·05	10·70	58·45
Wellewood	1·27	81·36	6·28	6·37	2·89	59·15
Dalkeith Coronation Seam	1·316	76·94	5·20	14·37	3·10	53·5
Kilmarnock Skerrington	1·241	79·82	5·82	11·31	1·25	49·3
Fordel Splint	1·23	79·58	5·50	8·33	4·00	52·03
Grangemouth	1·29	79·85	5·28	8·58	3·52	56·6
Eglinton	1·25	80·06	6·50	8·05	2·44	54·94
Dalkeith Jewel Seam	1·277	74·55	5·14	15·51	4·37	49·8
Slievardagh Irish Anthracite	1·59	80·03	2·30	*	10·80	90·1
Various:						
Coleshill Co.'s Bagilt Main	1·269	88·48	5·62	0·86	1·63	55·8
Ewloe	1·275	80·97	4·96	8·20	3·37	54·5
Ibstock	1·291	74·97	4·83	11·88	5·90	50·8
Patent Coals:						
Warlich's Patent Fuel	1·15	90·02	5·56	*	2·91	85·1
Livingstone's Steam Fuel	1·184	86·07	4·13	2·03	4·52	..
Lyons' Patent Fuel	1·13	86·36	4·56	2·07	4·66	..
Wylam's Patent Fuel	1·10	79·91	5·69	6·63	4·84	65·8
Bell's Patent Fuel	1·14	87·88	5·22	0·42	4·96	71·7
Holland and Green's Patent Fuel	1·302	70·14	4·65	..	13·73	..

Nitrogen and sulphur omitted, as being unimportant to this inquiry.
* Included in Ash.

TABLE X.—Showing the MEAN COMPOSITION of Average Samples of FOREIGN COALS.

Locality.	Carbon.	Hydrogen.	Oxygen.	Ash.
	B.	C.	F.	G.
Van Diemen's Land Coals:				
South Cape	63·40	2·89	1·01	30·45
Mount Nicholas Break-o'-Day	57·37	3·91	9·10	27·55
Tingal	57·21	3·38	7·80	29·60
Jerusalem	68·18	3·99	5·89	19·30
Douglas River, East Coast	70·44	4·20	9·27	14·38
Tasman's Peninsula	65·54	3·36	1·75	28·41
Schonten Island	64·01	3·55	3 38	27·17
Whale's Head, South Cape	65·86	3·18	7·20	21·50
Adventure Bay	80·22	3·05	4·80	8·67
Sydney, New South Wales	82·39	5·33	8·32	2·04
Borneo (Labuan Kind)	64·52	4·74	20·75	7·74
Borneo, Three Feet Seam	54·31	5·03	24·22	14·32
Borneo, Eleven Feet Seam	70·33	5·41	19·19	3·23
Formosa Island	78·26	5·70	10·95	3·96
Vancouver's Island	66·93	5·32	8·70	15·83
Lignite, Trinidad	65·20	4·25	21·69	6·84
Chili Coals:				
Conception Bay	70·55	5·76	13·24	7·32
Port Famine	64·18	5·33	22·75	6·21
Chirique	38·96	4·01	13·36	36·91
Laredo Bay	58·67	5·53	17·33	16·63
Talcahuano Bay	70·71	6·44	13·95	6·92
Colcurra Bay	78·30	5·50	8·37	5·63
Patagonia Coals:				
Sandy Bay, No. 1	62·25	5·05	17·54	13·49
Sandy Bay, No. 2	59·63	5·63	17·45	15·64

Nitrogen and sulphur omitted, as being unimportant to this inquiry.

APPENDIX, TABLE No. 103.

SHIPMENTS of COAL from NEWPORT since 1850.

Year.	Shipments Coastwise.	Shipments. Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851	451,491	151,668	603,159
1852	451,770	137,469	589,239
1853	450,530	111,888	562,418
1854	506,435	134,565	640,999
1855	474,873	187,647	662,520
1856	494,560	186,882	681,442
1857	523,047	187,338	709,385
1858	475,335	208,043	683,378
1859	513,966	175,245	689,211
1860	629,206	187,591	816,797
Total	4,970,203	1,668,346	6,638,549
1861	617,227	211,199	828,426
1862	585,633	202,888	788,521
1863	547,967	184,288	732,255
1864	609,732	282,016	891,748
1865	639,231	292 709	931,931
1866	659,896	378,032	1,037,928
1867	786,564	398,773	1,177,337
1868	646,213	332,907	979,119
1869	774,093	330,052	1,104,145
Total for 9 years	5,866,555	2,604,855	8,471,410

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Appendix, Table No. 104.

Shipments of Coal from Cardiff since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	501,002	249,001	750,003	Increase Coastwise 231,000 tons.
1852 - -	462,243	353,174	820,417	Do. Foreign 984,035 " "
1853 - -	485,713	429,495	915,208	Total Increase 1,165,035 " "
1854 - -	481,353	565,946	1,047,299	Increase per cent. 155·34
1855 - -	468,841	738,587	1,207,428	
1856 - -	551,984	846,863	1,398,847	
1857 - -	542,571	919,877	1,462,448	
1858 - -	592,745	798,741	1,391,486	
1859 - -	672,241	966,601	1,638,842	
1860 - -	782,002	1,133,066	1,915,008	
Total - -	5,540,695	7,006,371	12,547,066	
1861 - -	895,729	1,109,354	2,005,083	Decrease Coastwise 6,507 tons.
1862 - -	884,283	1,329,658	2,213,941	Increase Foreign 1,079,906 " "
1863 - -	865,260	1,475,698	2,340,958	Total Increase 1,073,589 " "
1864 - -	841,906	1,473,615	2,315,523	Increase per cent. 53·54 "
1865 - -	901,724	1,452,741	2,354,465	
1866 - -	890,585	1,861,683	2,752,268	
1867 - -	874,498	1,945,311	2,819,809	
1868 - -	787,984	2,156,206	2,944,190	
1869 - - -	889,213	2,189,460	3,078,673	
1870 - - -	..	..	..	
Total for 9 years	7,831,183	14,994,726	22,824,909	

Appendix, Table No. 105.

Shipments of Coal from Swansea since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	352,247	41,502	393,749	Decrease Coastwise 194,572 tons.
1852 - -	375,182	51,486	426,668	Increase Foreign 253,600 " "
1853 - -	454,406	73,549	527,955	Total Increase 130,028 " "
1854 - -	255,894	88,410	344,304	Increase per cent. 33·76
1855 - -	257,598	153,218	410,816	
1856 - -	301,355	185,406	486,663	
1857 - -	279,407	245,442	524,849	
1858 - -	240,700	269,084	509,784	
1859 - -	227,620	308,464	536,084	
1860 - -	227,675	295,102	522,777	
Total - -	2,951,984	1,711,665	4,663,649	
1861 - -	242,112	418,219	660,241	Increase Coastwise 4,963 tons.
1862 - -	255,531	454,451	709,972	Do. Foreign 70,105 " "
1863 - -	230,175	467,845	688,020	Total Increase 85,157 " "
1864 - -	264,683	534,653	793,655	Increase per cent. 12·89
1865 - -	261,596	489,553	751,139	
1866 - -	265,688	538,526	804,214	
1867 - -	294,053	478,679	772,713	
1868 - -	243,042	513,671	756,713	
1869 - - -	247,074	498,324	745,398	
1870 - -	..	..	..	
Total for 9 years	2,296,254	4,396,810	6,697,064	

Appendix, Table No. 106.

Shipments of Coal from Port Talbot since 1853.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1853 - -	65,831	1,920	67,751	Decrease Coastwise 3,866 tons.
1854 - -	68,988	3,689	72,677	Do. Foreign 1,589 " "
1855 - -	72,010	6,662	78,672	Total Decrease 5,455 " "
1856 - -	70,330	11,576	81,906	Decrease per cent. 8·00
1857 - -	61,638	4,343	65,981	
1858 - -	67,396	1,653	69,049	
1859 - -	56,459	361	56,820	
1860 - -	61,965	..	01,965	
Total -	524,617	30,204	554,821	
1861 - -	80,960	1,495	82,455	Decrease Coastwise 9,060 tons.
1862 - -	82,103	1,271	83,374	Increase Foreign 6,130 " "
1863 - -	71,598	645	72,243	Total Decrease 2,940 " "
1864 - -	58,608	1,499	60,107	Decrease per cent. 3·63 "
1865 - -	81,265	9,921	91,296	
1866 - -	86,764	9,511	96,275	
1867 - -	80,563	6,980	87,543	
1868 - -	77,498	8,276	85,774	
1869 - -	71,900	7,615	79,515	
1870 - - -	..	..	..	
Totakfor 9 years	691,259	47,213	738,472	

Appendix, Table No. 107.

Shipments of Coal from Neath since 1853.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1853 - -	106,185	5,258	111,443	Increase Coastwise 79,125 tons.
1854 - -	133,077	6,124	139,201	Do. Foreign 8,453 " "
1855 - -	145,865	10,304	156,169	Total Increase 87,607 " "
1856 - -	158,945	14,270	173,215	Increase per cent. 78·61
1857 - -	187,827	10,532	198,359	
1858 - -	185,574	16,020	201,594	
1859 - -	179,694	13,656	193,350	
1860 - -	185,310	13,740	199,050	
Total - -	1,282,477	89,904	1,372,381	
1861 - -	201,920	18,282	220,202	Decrease Coastwise 2,324 tons.
1862 - -	229,173	24,923	254,096	Increase Foreign 34,576 " "
1863 - -	239,744	27,714	267,458	Total Increase 32,252 " "
1864 - -	239,949	28,313	268,262	Increase per cent. 14·67
1865 - -	238,038	28,501	266,539	
1866 - -	240,981	43,055	284,036	
1867 - -	230,320	46,033	276,353	
1868 - -	199,281	47,242	246,523	
1869 - -	199,696	52,858	252,554	
1870 - - -	..	..	..	
Total for 9 years	2,019,102	316,921	2,336,023	

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Appendix, Table No. 108.

Shipments of Coal from Porth-Cawl since 1853.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1853 - -	28,281	..	28,281	Decrease Coastwise 11,085 tons.
1854 - -	23,185	..	23,185	Do. Foreign 135 "
1855 -	20,882	219	21,101	Total Decrease 11,206 "
1856 - -	22,569	200	22,769	Decrease per cent. 39·60 "
1857 - -	20,275	35	20,310	
1858 - -	23,054	96	23,150	
1859 - -	19,900	..	19,900	
1860 - -	17,196	..	17,196	
Total - -	174,342	550	174,892	
1861 - -	16,573	..	16,573	Increase Coastwise 99,577 tons.
1862 - -	20,548	..	20,548	Do. Foreign 31,366 "
1863 - -	21,326	..	21,326	Total Increase 131,385 "
1864 - -	16,966	..	16,966	Increase per cent. 752·6 "
1865 - -	10,419	340	10,759	
1866 - -	43,603	900	44,503	
1867 - -	90,968	13,976	104,944	
1868 - -	108,679	25,221	133,900	
1869 - - -	116,250	21,648	137,898	
1870 - -	..	..	..	
Total for 9 years	445,332	63,085	507,417	

Appendix, Table No. 109.

Shipments of Coal from Llanelly since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	219,460	9,785	229,245	Increase Coastwise 64,710 tons.
1852 - -	214,735	8,838	223,573	Do. Foreign 80,211 "
1853 - -	245,948	11,573	257,521	Total Increase 144,921 "
1854 - -	266,402	22,502	288,904	Increase per cent. 65·21 "
1855 - -	287,444	24,118	311,562	
1856 - -	297,207	32,876	330,083	
1857 - -	333,099	49,818	382,917	
1858 - -	280,926	81,831	362,757	
1859 - -	285,745	76,366	362,111	
1860 - -	284,170	89,996	374,166	
Total -	2,715,136	407,703	3,122,839	
1861 - -	278,270	111,103	389,373	Decrease Coastwise 123,879 tons.
1862 - -	265,641	115,021	380,662	Increase Foreign 15,730 "
1863 - -	220,539	115,700	336,239	Total Decrease 108,149 "
1864 - -	252,710	134,669	387,379	Decrease per cent. 38·45
1865 - -	245,969	137,196	383,165	
1866 -	201,620	137,735	339,355	
1867 - -	209,736	158,904	368,640	
1868 - -	180,881	128,689	309,570	
1869 - - -	154,391	126,833	281,224	
1870 - -	..	..	..	
Total for 9 years	2,009,757	1,165,850	3,175,607	

Appendix, Table No. 110.

Shipments of Coal from Milford since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	49,573	269	49,842	Increase Coastwise 1,778 "
1852 - -	50,102	371	50,473	Do. Foreign 234 "
1853 - -	48,627	540	49,167	Total Increase 1,554 "
1854 - -	51,544	1,255	52,799	Increase per cent. 3·11 "
1855 - -	49,119	292	49,411	
1856 - -	47,566	323	47,889	
1857 - -	57,364	641	58,005	
1858 - -	54,510	..	54,510	
1859 - -	46,264	101	46,365	
1860 - -	51,351	45	51,396	
Total - -	506,020	3,837	509,857	
1861 - -	51,382	540	51,922	Increase Coastwise 7,038 tons.
1862 - -	56,069	1,575	57,644	Decrease Foreign 290 "
1863 - -	44,462	650	45,112	Total Increase 6,548 "
1864 - -	59,777	628	60,405	Increase per cent. 12·89 "
1865 - -	47,178	878	48,056	
1866 - -	42,517	2,478	44,995	
1867 - -	48,745	847	49,592	
1868 - -	49,824	250	50,074	
1869 - - -	58,464	..	58,464	
1870 - -	..	..	..	
Total for 9 years	458,418	7,846	466,264	

Appendix, Table No. 111.

Shipments of Coal from Glasgow since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.	
	Tons.	Tons.	Tons.	
1851 - -	86,893	44,138	131,031	Increase Coastwise 18,038 tons.
1852 - -	81,966	44,956	126,922	Do. Foreign 10,980 "
1853 - -	59,466	45,340	104,806	Total Increase 29,018 "
1854 - -	66,442	55,277	121,719	Increase per cent 23·10 "
1855 - -	69,210	47,608	116,818	
1856 - -	73,066	45,998	119,061	
1857 - -	88,165	56,167	144,332	
1858 - -	76,744	56,696	133,440	
1859 - -	78,682	60,716	139,398	
1860 - -	104,931	55,058	159,989	
Total - -	805,567	511,969	1,317,536	
1861 - -	109,116	82,953	192,070	Increase Coastwise 19,688 tons.
1862 - -	113,975	98,444	211,419	Foreign 68,366 "
1863 - -	121,166	88,697	209,863	Total Increase 87,941 "
1864 - -	129,382	89,356	218,738	Increase per cent. 45·78 "
1865 - -	116,513	88,851	205,364	
1866 - -	117,119	85,249	202,368	
1867 - -	153,125	135,594	287,719	
1868 - -	126,461	149,404	275,865	
1869 - - -	123,861	151,219	280,011	
1870 - -	..	..	..	
Total of 9 years	1,113,699	969,757	2,083,457	

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APPENDIX, TABLE No. 112.

SHIPMENTS of COAL from IRVINE since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	224,193	115,845	340,038
1852 - -	250,847	67,419	318,266
1853 - -	239,831	86,563	326,394
1854 - -	234,865	63,001	297,866
1855 - -	264,625	48,257	312,882
1856 - -	178,833	79,786	258,619
1857 - -	241,180	123,961	365,141
1858 - -	242,321	110,635	352,956
1859 - -	234,288	103,154	337,442
1860 - -	367,319	129,799	497,118
Total - -	2,478,302	928,420	3,406,722
1861 - -	391,795	115,580	507,375
1862 - -	401,102	144,922	546,024
1863 - -	..	65,465	65,465
1864 - -	280,616	..	280,616
1865 - - -	..	..	..
1866 - -	..	..	..
1867 - -	..	..	..
1868 - -	..	..	..
1869 - - -	..	..	..
1870 - -	..	..	..
Total of 4 years	1,073,513	325,967	1,399,480

Increase Coastwise 143,136 tons.
Do. Foreign 13,954 " "
Total Increase 157,090 " "
Increase per cent. 46·19 " "

Decrease Coastwise 111,179 tons.
Do. Foreign 80,115 " "
Total Decrease 191,294 " "
Decrease per cent. 61·78 " "

APPENDIX, TABLE No. 113.

SHIPMENTS of COAL from AYR since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	72,569	516	73,085
1852 - -	72,888	1,226	74,114
1853 - -	73,442	999	74,441
1854 - -	62,280	408	62,688
1855 - -	64,400	26	64,426
1856 - -	97,801	509	98,310
1857 - -	89,404	1,598	91,002
1858 - -	78,535	900	79,435
1859 - -	75,108	1,936	77,044
1860 - -	65,453	1,410	66,863
Total - -	751,880	9,528	761,408
1861 - -	109,425	2,006	111,431
1862 - -	151,640	3,330	154,970
1863 - -	118,685	2,916	121,601
1864 - -	152,252	1,874	154,126
1865 - -	119,612	985	120,597
1866 - -	106,137	3,363	109,500
1867 - -	120,458	2,549	122,987
1868 - -	110,614	2,768	113,382
1869 - -	100,176	2,508	102,684
1870 - - -	..	..	..
Total of 9 years	1,088,979	22,299	1,111,278

Decrease Coastwise 7,116 tons.
Increase Foreign 894 " "
Total Decrease 6,222 " "
Decrease per cent. 8·51 " "

Decrease Coastwise 9,240 tons.
Do. Foreign 503 " "
Total Decrease 8,747 " "
Decrease per cent. 1·51 " "

APPENDIX, TABLE No. 114.

SHIPMENTS of COAL from GREENOCK since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	85	30,792	30,877
1852 - -	260	22,767	23,027
1853 - -	50	21,326	21,376
1854 - -	1,415	22,708	24,123
1855 - -	80	27,220	27,300
1856 - -	50	23,792	23,842
1857 - -	572	35,812	36,384
1858 - -	426	28,721	29,147
1859 - -	2,221	44,464	46,685
1860 - -	14,700	49,105	63,805
Total - -	19,859	306,707	326,566
1861 - -	13,715	66,746	80,461
1862 - -	10,895	62,370	73,265
1863 - -	7,929	72,394	80,323
1864 - -	11,889	81,087	92,976
1865 - -	10,176	82,508	92,684
1866 - -	7,253	74,874	82,127
1867 - -	12,831	103,844	116,675
1868 - -	8,597	133,987	142,584
1869 - - -	9,868	104,728	114,596
1870 - -	..	..	..
Total of 9 years	93,153	782,538	875,691

Increase Coastwise 14,615 tons.
Do. Foreign 18,313 " "
Total Increase 32,928 " "
Increase per cent. 106·64 " "

Decrease Coastwise 3,847 tons.
Increase Foreign 27,963 " "
Total Increase 24,135 " "
Increase per cent. 42·17 " "

APPENDIX, TABLE No. 115.

SHIPMENTS of COAL from TROON since 1863.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1863 - - -	..	54,391	54,391
1864 - - -	280,616	107,430	388,046
1865 - - -	341,672	117,683	459,354
1866 - - -	345,588	116,156	461,744
1867 - - -	406,001	102,250	508,251
1868 - - -	355,914	113,617	469,531
1869 - -	367,890	119,080	486,970
1870 - - -	..	..	..
Total of 7 years	2,097,681	730,606	2,828,287

Increase Coastwise 37,274 tons.
Do. Foreign 64,689 " "
Total Increase 101,963 " "
Increase per cent. 706·51 " "

APPENDIX, TABLE No. 116.

SHIPMENTS of COAL from ARDROSSAN since 1863.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1863 - - -	327,487	27,956	355,443
1864 - - -	77,784	87,688	165,472
1865 - - -	101,705	71,655	173,360
1866 - - -	111,068	63,319	174,407
1867 - - -	167,975	59,909	227,884
1868 - - -	142,677	81,004	223,681
1869 - - -	125,017	75,370	198,389
1870 - -	..	..	..
Total of 7 years	1,051,733	466,901	1,518,636

Decrease Coastwise 204,470 tons.
Increase Foreign 47,414 " "
Decrease Total 157,056 " "
Do. per cent. 79·66 " "

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Appendix, Table No. 117.

Shipments from Port Glasgow since 1851.

Year.	Shipments Coastwise.	Shipments Foreign.	Total.
	Tons.	Tons.	Tons.
1851 - -	..	9,212	9,212
1852 - -	..	5,564	5,564
1853 - -	..	5,529	5,529
1854 - -	20	5,465	5,485
1855 - -	..	6,207	6,207
1856 - -	..	5,346	5,346
1857 - -	..	7,608	7,608
1858 - -	..	3,159	3,159
1859 - -	110	3,282	3,390
1860 - -	50	6,001	6,051
Total -	180	57,373	57,553

Increase Foreign - 3,211 tons.
Decrease Foreign -

Shipments of Coal from Port Glasgow since 1861.

Year.	Coastwise.	To Foreign Ports.	Total.
	Tons.	Tons.	Tons.
1861 - -	..	7,941	7,941
1862 - -	..	10,331	10,331
1863 - -	..	12,834	12,834
1864 - -	..	6,270	6,270
1865 - -	..	14,323	14,323
1866 - -	..	7,239	7,239
1867 - -	..	9,071	9,071
1868 - -	1,730	21,817	23,547
1869 - -	9,540	17,988	27,528
1870 - -	..	..	..
Total of 9 years	11,270	107,814	119,084

Increase Coastwise in 2 years 7,810 tons.
Do. Foreign in 9 years - 10,047 " "
Do. Total in 9 years - 19,857 " "
Do. per cent. - 246·65 " "

Appendix, Table No. 118.

Shipments of Coal from Grangemouth since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - - -	6,521	16,185	22,706
1852 - - -	2,943	18,675	21,618
1853 - - -	2,039	24,149	26,188
1854 - - -	4,294	10,411	23,705
1855 - - -	2,334	53,082	55,416
1856 - - -	1,021	44,281	45,302
1857 - - -	922	38,819	39,741
1858 - - -	952	37,797	38,749
1859 - - -	2,704	47,334	50,038
1860 - - -	1,799	62,409	64,208
Total - -	25,529	362,142	387,671

Decrease Coastwise 4,723 tons.
Increase Foreign 46,224 " "
Total Increase 41,501 " "
Increase per cent. 82·77 " "

1861 - - -	3,389	74,174	77,563
1862 - - -	2,199	93,677	95,876
1863 - - -	867	94,445	95,312
1864 - - -	2,785	84,759	87,544
1865 - - -	3,119	118,036	121,155
1866 - - -	3,318	110,971	114,289
1867 - -	2,666	119,113	121,779
1868 - - -	1,679	133,555	135,234
1869 - - -	1,803	103,181	104,984
1870 -	..	..	..
Total of 9 years	18,219	931,911	953,756

Decrease Coastwise 1,566 tons.
Increase Foreign 99,007 " "
Total Increase 97,451 " "
Increase per cent. 95·35 " "

Appendix, Table No. 119.

Shipments of Coal from Borrowstoness since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - - -	36,359	65,796	102,155
1852 - - -	34,450	53,228	87,678
1853 - - -	31,442	70,183	101,625
1854 - - -	35,549	63,127	98,676
1855 - - -	37,637	109,341	146,978
1856 - - -	122,602	127,542	250,144
1857 - - -	119,557	138,024	257,581
1858 - - -	108,092	128,952	237,045
1859 - -	113,339	167,888	281,217
1860 - - -	124,354	151,973	276,327
Total - -	763,352	1,076,054	1,839,406

Increase Coastwise 87,993 tons.
Do. Foreign 86,177 " "
Total Increase 174,178 " "
Increase per cent. 170·40 " "

1861 - - -	124,152	168,152	292,304
1862 - - -	99,006	163,930	262,936
1863 - - -	102,589	163,765	266,354
1864 - - -	105,845	164,314	270,159
1865 - - -	88,365	162,029	250,394
1866 - - -	30,139	177,154	207,293
1867 - - -	30,000	185,033	215,033
1868 - - -	66,721	260,430	327,151
1869 - -	74,392	197,571	271,963
1870 - - -	..	..	..
Total of 9 years	721,209	1,642,388	2,363,587

Decrease Coastwise 49,760 tons.
Increase Foreign 29,410 " "
Total Decrease 20,341 " "
Decrease per cent. 7·40 " "

Appendix, Table No. 120.

Shipments of Coal from Kirkaldy since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - - -	37,035	44,074	81,109
1852 - - -	29,504	34,173	63,677
1853 - - -	36,334	31,813	68,147
1854 - - -	34,892	25,800	60,692
1855 - - -	39,266	28,465	67,731
1856 - - -	36,683	31,534	68,217
1857 - - -	34,953	40,611	75,564
1858 - - -	35,773	35,005	70,778
1859 - - -	39,026	60,695	99,721
1860 - - -	43,823	73,769	117,597
Total - -	367,294	405,939	773,233

Increase Coastwise 6,796 tons.
Do. Foreign 29,865 " "
Total Increase 36,488 " "
Increase per cent. 44·96 " "

1861 - - -	44,297	79,747	124,044
1862 - - -	55,453	83,951	138,403
1863 - - -	50,156	80,333	130,489
1864 - - -	53,990	93,900	146,890
1865 - - -	59,001	121,560	180,561
1866 - - -	61,912	127,449	189,361
1867 - - -	57,467	154,645	212,112
1868 - - -	55,792	220,215	276,007
1869 - -	56,272	203,466	259,738
1870 - - -	..	..	..
Total for 9 years	496,339	1,164,266	1,657,605

Increase Coastwise 11,975 tons.
Do. Foreign 125,719 " "
Total Increase 135,694 " "
Increase per cent. 109·39 " "

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Appendix, Table No. 121.

Shipments of Coal from LEITH since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	9,091	13,086	22,177
1852 - -	8,358	18,623	26,981
1853 - -	10,359	23,582	33,941
1854 - -	14,333	23,635	38,033
1855 - -	10,401	29,853	40,254
1856 - -	5,839	34,393	40,232
1857 - -	4,590	27,955	32,545
1858 - -	6,769	28,248	35,017
1859 - -	7,483	38,096	45,539
1860 - -	6,696	35,593	42,289
Total -	83,874	273,114	355,988
1861 - -	6,269	48,840	55,109
1862 - -	10,575	57,697	68,272
1863 - -	13,907	59,737	73,639
1864 - -	11,242	67,395	78,637
1865 - -	17,772	87,144	104,916
1866 - -	10,295	71,476	81,771
1867 - -	12,494	80,279	92,783
1868 - -	6,798	87,672	94,470
1869 - - -	10,716	85,069	95,785
1870 - -	..	..	..
Total for 9 years	99,973	645,409	745,382

Decrease Coastwise 2,885 tons
Do. Foreign 22,507 " " "
Total Increase 20,118 " " "
Increase per cent. 90·65 " " "

Increase Coastwise 4,447 tons
Do. Foreign 36,269 " " "
Total Increase 40,676 " " "
Increase per cent. 75·81 " " "

Appendix, Table No. 122.

Shipments of Coal from DUNDEE since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	345	22,058	22,403
1852 - -	1,531	21,870	23,401
1853 - -	2,378	23,582	25,960
1854 - -	2,704	26,472	29,176
1855 - -	1,506	35,295	36,801
1856 - -	340	51,715	52,055
1857 - -	80	41,069	41,149
1858 - -	241	40,659	40,900
1859 - -	2,555	37,633	40,188
1860 - -	934	28,786	29,720
Total -	12,361	328,139	341,440
1861 - -	1,537	36,017	37,554
1862 - -	1,417	44,089	45,506
1863 - -	116	33,717	33,833
1864 - -	225	31,039	31,264
1865 - -	157	37,535	37,692
1866 - -	1,018	32,291	33,309
1867 - -	406	40,240	40,646
1868 - -	999	62,309	63,308
1869 - -	1,199	52,253	53,452
1870 - - -	..	..	..
Total for 9 years	7,079	369,490	376,566

Decrease Coastwise 538 tons
Increase Foreign 16,236 " " "
Total Increase 15,698 " " "
Increase per cent. 42·33 " " "

Appendix, Table No. 123.

Shipments of Coal from ALLOA since 1850.

Year.	Shipments Coastwise.	Shipments Foreign.	Total Shipments.
	Tons.	Tons.	Tons.
1851 - -	23,015	32,899	55,914
1852 - -	18,266	29,089	47,355
1853 - -	21,426	46,652	68,078
1854 - -	19,943	45,483	65,426
1855 - -	20,985	32,433	53,417
1856 - -	23,750	58,969	82719
1857 - -	19,166	71,681	90,847
1858 - -	15,850	71,864	87,714
1859 - -	15,064	76,051	91,115
1860 - -	13,750	59,217	72,967
Total -	191,155	524,367	715,552
1861 - -	12,552	56,391	68,943
1862 - -	12,525	51,152	63,677
1863 - -	10,347	40,763	51,110
1864 - -	45,867	51,906	97,773
1865 - -	5,199	79,650	84,849
1866 - -	6,168	70,565	76,728
1867 - -	8,807	88,857	97,664
1868 - -	16,457	121,161	137,618
1869 - - -	12,305	96,177	108,982
1870 - -	..	..	..
Total for 9 years	130,702	656,642	787,344

Decrease Coastwise 9,963 tons.
Increase Foreign 86,713 " " "
Total Increase 17,063 " " "
Increase per cent. 30·49 " " "

Increase Coastwise 283 tons
Do. Foreign 30,756 " " "
Total increase 40,039 " " "
Increase per cent. 33·97 " " "

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APPENDIX No. 124.

STATISTICS OF THE COAL BROUGHT TO LONDON IN 1870.

Re-arranged from the Returns collected by J. R. Scott, Esq., of the Coal Exchange, and published with the authority of the Corporation of London.

London and North-western Railway.

Coal brought to London from the following Collieries in the year 1870.

DURHAM AND NORTHUMBERLAND COALFIELD.

Names of Collieries.	Tons.	Cwts.
Auckland Park	344	2
Castle Eden	14	19
Chester South Moor	108	—
East Brancepeth	31	17
East Hetton	196	14
East Pontop	19	4
Harraton	17	8
Haswell	31	2
Lambton	2,037	3
Newton Cap	85	—
North Bitchburn	61	4
Old Butterknowle	6	8
Pease's West	6	14
Penshaw	254	—
Rough Lea	8	11
South Durham	13	16
South Hetton	341	11
South Kelloe	565	3
Stella Gill	16	12
Tanfield Lea	64	1
Thornley	89	12
Thrislington	14	9
Tees Walls End	1,169	15
Tindale	117	8
Wallsend	30	5
Total	5,644	18

YORKSHIRE COALFIELD.

Names of Collieries.	Tons.	Cwts.
Aldwarke Main	798	7
Alma	2,228	12
Altofts	284	7
Astley	7	12
Aston Hall	6	11
Barnsley	2,346	3
Chambers	84	19
Chapel Town	117	1
Crigglestone	455	—
Denaby Main	96	6
Diggles Siding	14	18
East Gawber	52	16
Edmunds Main	47	4
Elsecar	15	—
Flockton	12	—
Gawber	56	19
High Royd	7	17
Holmes	206	10
Huddersfield	14	11
Land Hill	14	16
North Staveley	67	4
Oaks	824	16
Old Silkstone	4,069	4
Orgreaves	37	12
Pilley	45	8
Rockley	65	8
Sharlston	17	4
Sheffield	61	11
Sherburn	43	18
Shipley	11,255	—
Shipley Gate	17	1
Silkstone	2,279	3
Silkstone Fall	290	7
South Yorkshire	2,988	16
Staveley	10,899	10
Strafford	623	12
Swaithe	3,351	—
Tankersley	146	16
Thrybergh Hall	256	2
Victoria	188	2
Wakeswood	60	8
Wentworth	56	14
West Riding	9,663	11
West Staveley	1,155	10
Wharncliffe	1,195	2
Wheldale	31	17
Wombell Main	4,195	17
Total	60,653	13

DERBYSHIRE COALFIELD.

Names of Collieries.	Tons.	Cwts.
Alsager	37	17
Avenue	466	17
Bennerley	699	—
Birley	7,857	16
Bretby	421	3
Brampton	7	9
Cadley Hill	55	3
Church Gresley	700	2
Codnor Park	40,682	13
Clay Cross	91,600	3
Denby Grange	137	14
Dronfield	1,772	14
Dunston	3,116	13
Eckington	448	18
Granby	1,795	9
Grassmoor	3,108	15
Gresley Wood	4	14
Haaland	326	18
Hennor	10	16
Ilkeston	5	8
Langley	2,064	19
Langley Mill	3,910	8
Marshay	6,194	18
Monkwood	49	6
New Birchwood	15,698	19
New Hill	5	8
New Tapton	547	8
Pinxton	11,528	5
Pilsley	104	9
Pyebridge	5	18
Renishaw	958	18
Renishaw Park	24,209	—
Riddings	26,524	9
Ripley	2,375	9
Rutland	946	14
Sheepbridge	10,999	18
Shirland	7,316	17
Stanton	44	3
Stoneyford	518	9
Swadlingcote	1,792	10
Swanwick	9,123	14
Tapton	446	—
Tibshelf	1,325	8
Unstone	65	1
Upper Birchwood	886	5
Wainsgrove	2,728	6
Whittington	11,038	13
Williamthorpe	85	1
Wingerworth	48	—
Wingfield	6,726	7
Total	308,461	13

NOTTINGHAMSHIRE COALFIELD.

Names of Collieries.	Tons.	Cwts.
Annesley	2,297	5
Babbington	2,245	11
Cotmanhay	2,442	6
Eastwood	2,455	3
Hucknall	1,077	11
Mexboro'	95	9
Nottingham Gas Coke	5	3
Plumtree	991	16
Portland	545	12
Radford	30	13
Retford	747	17
Skegby	144	19
Teversall	159	4
Hill Top	21	5
Total	13,259	17

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Warwickshire Coalfield.

Names of Collieries.	Tons.	Cwts.
Ansington	204	7
Baddesley	27,407	11
Charity	1,092	11
Counden Road	4	10
Coventry (Gas)	9	—
Glascote	36	8
Griff	3,057	15
Haunchwood	5	—
Hawkesbury	4,570	10
Polesworth	16	—
Pooley Hall	44	8
Rugby	231	11
Stretton	11	14
Swannington	164	1
Tame Valley	8	14
Tamworth	14	14
Wyken	134	—
Total	37,012	14

Leicestershire Coalfield.

Bagworth	23	4
Ibstock	121	2
Leicester	27	18
Moira	152	14
Nailstone	6,768	17
Snibstone	532	13
Whitwick	723	4
Total	8,349	12

North Staffordshire Coalfield.

Apedale	240	19
Black Bull	19	13
Bucknall	6	—
Etruria	135	19
Harecastle	1,006	18
Madeley	203	16
Podmore	429	18
Silverdale	1,914	2
Talk-o'-th'-Hill	17,788	1
Total	21,745	6

South Staffordshire Coalfield.

Birmingham	6	19
Bradley Hall	7	18
Cannock Chase	20,297	2
Cannock and Rugeley	9,124	—
Conduit	200	15
Cradley	8	—
Dudley	12	18
Hednesford	41	13
Pelsall	35	18
Round Oak	202	11
Soho	102	11
Spon Lane	37	—
Wednesbury	43	9
Total	30,120	14

Lancashire Coalfield.

Anderton Hall	62	1
Arley Main	97	7
Atherton	247	15
Bagshaw	64	11
Barley Brook	58	15
Bickershaw	54	18
Coppull	10	10
Douglas Bank	5,426	16
Edge Green	492	19
Garswood Hall	573	19
Garswood Park	120	—
Gerrard's Siding	15	4
Gibfield	5	15
Gidlow and Swinley	17,760	5
Guide Bridge	93	4
Haydock	78	5
Hindley	813	7

Lancashire Coalfield—continued.

Names of Collieries.	Tons.	Cwts.
Hindley Field	1,709	15
Holme House	5,966	11
Ince	76	8
Ince Hall	18,700	9
Ladies Lane	1,828	17
Mesnes	137	12
Morley	56	6
Moss Hall	329	19
Norley	392	14
Orrell	24,473	17
Park Lane	399	5
Patricroft	8	5
Pemberton	8,951	17
Platt Lane	57	—
Riding Lane	1,649	4
Rose Bridge	1,882	6
Saint Helen's	656	12
Scot Lane	16	—
Spring	1,475	15
Strangeways Hall	31	—
Tawd Vale	58	—
Tyldesley	21	12
Wigan Coal and Iron Company	95,062	6
Winstanley	3,372	6
Winter Grange	18	15
Total	193,310	1

North Wales Coalfield.

Bagilt	6	10
Coed Talon	11,460	16
Mold	189	10
Ruabon	303	8
Queen's Ferry	27	6
Total	11,987	10

Other Collieries and Sundries.

Abercorn	3,935	13
Birch Coppice	8	—
Coke (Loco.)	12,855	—
Copley Hill	90	5
Daneantoor	1,476	18
Digeake	152	19
Falls Wood	6	—
Fir Tree House	209	19
Haunchwood	4	15
Northampton	8	7
Nunnery	135	19
Reservoir	200	3
Rose Grove	43	6
Scowcroft	7	2
Snyd Hall	1,615	9
Withington Hall	33	—
Total	20,762	15

Summary of Coal brought to London in the Year 1870.

Coalfields.	Quantities. Tons.	cwts.
Durham and Northumberland	5,644	18
Yorkshire	60,653	12
Derbyshire	368,461	12
Nottinghamshire	18,259	17
Warwickshire	37,012	14
Leicestershire	8,349	12
North Staffordshire	21,745	6
South Staffordshire	30,120	14
Lancashire	193,310	1
South Wales	123,972	15
North Wales	11,987	10
Other Collieries and Sundries	20,762	15
Total	835,281	6

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Great Western Railway.

Yorkshire Coalfield.

Names of Collieries.	Tons.
Altofts	797
Barnsley	32
Edmunds	8
Kilnhurst	150
Masboro'	101
Normanton	29
Old Silkstone	44
Rawmarsh	170
Shipley	123
Shipley Gate	2,778
Silkstone	127
South Yorkshire	21
Staveley	10,511
West Staveley	644
Wharncliffe	15
Total	15,550

Derbyshire Coalfield.

Bennerley	175
Bretby	272
Clay Cross	21,317
Coates Park	156
Codnor Park	5,909
Denby	32
Doe Hill	43
Dronfield	926
Dunston and Barlow	63
Eckington	713
Granby	37
Heanor Junction	1,058
Langley Mill	1,098
Monkwood	370
New Birchwood	11,718
North Eckington	10,827
Pinxton	8,064
Pyebridge	178
Riddings	33
Ripley	296
Sheepbridge	1,312
Swadlingcote	62
Tapton	2,667
Tibshelf	1,271
Unstow	29
Whittington	1,164
Wingerworth	24
Wingfield	1,180
Total	70,994

Nottinghamshire Coalfield.

Annesley	529
Basford	1,179
Hucknall	56
Mexboro'	4,538
Retford	10
Teversal	24
Total	6,336

Warwickshire Coalfield.

Coventry	7
Stretton	881
Total	888

Leicestershire Coalfield.

Bagworth	76
Coalville	259
Moira	15
Total	350

South Staffordshire Coalfield.

Names of Collieries.	Tons.
Birmingham	6
Brettle Lane	66
Cannock Chase	384
Cradley	42
Hednesford	7
Round Oak	350
Wednesbury	1,881
Total	2,736

North Staffordshire Coalfield.

Madeley	20
Marehay	181
Podmore	17
Silverdale	137
Talk-o'-th'-Hill	3,509
Total	3,864

Lancashire Coalfield.

Orrell	238
Pemberton	848
Saint Helen's	12
Spring Branch	1,721
Wigan Coal and Iron Company	7,781
Winstanley	57
Total	10,657

Somersetshire Coalfield.

Bath	36
Radstock	28
Total	64

Gloucestershire Coalfield.

Bilson	4,294
Bristol	37
Bullopill	106
Lydney	320
Total	4,757

North Wales Coalfield.

Coed Talon	450
Llangollen	16
Ponkey	12,344
Ruabon	3,181
Wrexham	18
Wheatsheaf	18
Total	15,922

Shropshire Coalfield.

Gobowen	15
Lilleshall	8,514
Total	8,529

Other Collieries and Sundries.

Alsayce	21
Aure Junction	987
Bagnor	8
Cambridge	15
Coke (Loco.)	10,197
East Pontop	30
Guildford, no colliery	16
Poyntor	5
Scowcroft	58
Sneamote	11
South Hetton	26
Stratford, no colliery	16
Sundries	146
Twyford, no colliery	12
Woodford	20
Woodville	143
Total	11,691

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SUMMARY OF COAL BROUGHT TO LONDON IN THE YEAR 1870.

Coalfields.	Quantities.
	Tons.
Yorkshire	15,550
Derbyshire	70,994
Nottinghamshire	6,836
Warwickshire	888
Leicestershire	350
South Staffordshire	2,736
North Staffordshire	3,864
Lancashire	10,657
Somersetshire	64
Gloucestershire	4,757
Shropshire	8,529
North Wales	15,922
South Wales	318,514
Other Collieries and Sundries	11,691
Total	470,852

Great Northern Railway.

DURHAM AND NORTHUMBERLAND COALFIELD.

Names of Collieries.	Tons.
Adelaide	1,228
Auckland Park	7,186
Bishop's Close	29
Blaydon Main	170
Black Prince	128
Brancepeth	17,879
Brandon	7
Castle Eden	1,900
Chester, South Moor	1,072
Cocken	17
Cold Knott	16
Consett	628
Coxhoe	30
East Brancepeth	818
East Castle	141
East Hetton	15,852
East Pontop	6,640
East Tanfield	37
Edmondsley	21
Eldon	31
Esh Hall	5
Framwellgate	14
Garesfield	264
Hamsterley	33
Haswell	8,602
Hetton	569
Heugh Hall	1,693
Hough Hall	374
Hunwick	78
Lambton Walls End	64,415
Ludworth	47
Lumley	8
New Belmont	3,439
New Pelton	14
Newton Cap	6,879
North Bitchburn	301
North Brancepeth	158
North Hetton	1,773
Old Butterknowle	15
Old Durham	487
Old Etherley	160
Pease's East	844
Pease's West	3,142
Pelaw Main	3,773
Pelton West	8
Pensher	5,436
Shincliffe	63
Shotton	28
South Brancepeth	175
South Durham	5,132
South Hetton	13,283
South Kelloe	7,494
South Medomsley	47
Tanfield Lea	310

DURHAM AND NORTHUMBERLAND COALFIELD—*continued.*

Names of Collieries.	Tons.
Tees Walls End	14,827
Thrislington	2,883
Thornley	4,535
Tindale	776
Trimdon Grange	1,046
Tudhoe	51
Usworth	101,397
Waldridge	64
Washington	2,403
West Auckland	15
West Belmont	16
West Bitchburn	8
West Brancepeth	305
West Thornley	14
West Tees	1,526
Wingate	2,320
Woodhouse Close	655
Total	315,229

YORKSHIRE COALFIELD.

Aldwarke Main	241
Alma	396
Aston	8
Blacker	397
Brightside	55
Carbrook	16
Chambers	20
Darfield Main	19,069
Denaby	1,916
Dirtcar	19
East Gawber	1,020
Edmunds Main	2,844
Elsecar	8,252
Foxholes	37
Girleston	8
Habergham	61
High Royd	130
High Style	66
Homes	14
Hoyland	15
Kilnhurst	22
Kiveton Park	267
Lund Hill	18,720
Mauvers Main	28
Mount Osborne	1,378
Newshorpe	3,665
North Gawber	60
Nastell	7
Oaks	6,742
Orgreaves	255
Pinder Oaks	162
Robin Hood	772
Rockley	873
Rothwell Haigh	15
Sharlston	504
Silkstone, Charlesworth's	616
Clarke's	26,029
Cooper's	30,724
Grange	2,798
Newton	26,885
Strafford	10,840
Wharncliffe	34,627
Woolleys'	29
Silkstone Fall	360
Shipley	2,950
Staveley	14,051
Swaithe	15,803
Thorncliffe	50
Thrybergh Hall	5,154
Tinsley	1,713
Victoria	1,455
Waleswood	60
Westwood	54
West Riding	3,717
West Staveley	5,011
Wheldale	70
Whitwood	1,325
Wombell Main	11,343
Worsborough Park	2,099
Wrenthorpe	306
Total	265,608

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Derbyshire Coalfield.

Names of Collieries.	Tons.
Alsager	19
Avenue	46
Birley	89,107
Brampton	4,474
Brethy	219
Clay Cross	59,142
Codnor Park	11,205
Denby Grange	457
Dronfield	701
Dunston	35
Eckington	43,973
Granby	30
Grassmoor	7,481
Hasland	284
Heanor	15,634
Killamarsh	638
Langley	5
Langley Mill	10,234
Marehay	328
Monkwood	4,204
Newfield	87
New Birchwood	17,609
New Hill	23
Oakerthorpe	85
Pilsley	4,433
Pinxton	30,668
Renishaw	1,512
Riddings	36,341
Ripley	2,710
Rutland	591
Sheepbridge	13,056
Stoneyford	1,054
Shirland	1,959
Sutton	69
Swadlingcote	12
Swanwick	13,651
Taplow	3,042
Tibshelf	3,897
Unstone	1,683
Upper Birchwood	961
Wainsgrove	186
Whillington	1,311
Wingfield	86
Williamthorpe	7
Wingerworth	284
Total	333,683

Leicestershire Coalfield.

Leicester	29
Snibstone	527
Swannington	1,198
Whitwick	30
Total	1,784

North Staffordshire Coalfield.

Black Bull	200
Harecastle	463
Hayes	278
Podmore	391
Talk-o'-th'-Hill	4,952
Total	6,284

Nottingham Coalfield.

Annesley	5,341
Babbington	13,617
Cotmanhay	2,606
Digby	109
Eastwood	6,464
Huckhall	3,297
Plumtree	61
Shirecoaks	587
Skegby	14
Teversal	389
Total	32,485

Other Collieries and Sundries.

Names of Collieries.	Tons.
Aberdare	228
Black Shale	8
Coke (Loco.)	14,661
Devonshire	2,126
Leadgate	153
Nottingham Gas Coke	4,123
Pitsmoor	32
Sundries	263
Mountain Ash	797
Total	22,391

Lancashire Coalfield.

Saint Helen's	26
Wigan	559
Total	585

Summary of Coal brought to London in the Year 1870.

Coalfields.	Quantities.
	Tons.
Durham and Northumberland	315,229
Yorkshire	265,608
Derbyshire	333,683
Nottinghamshire	32,485
Leicestershire	1,784
North Staffordshire	6,284
Lancashire	585
Other Collieries and Sundries	22,391
Total	978,049

Midland Railway.

Coal brought to London from the following Collieries in the Year 1870.

Durham and Northumberland Coalfield.

Names of Collieries.	Tons.
Auckland Park	8
Brancepeth	8
Castle Eden	43
East Pontop	243
Houghall	305
Lambton	4,410
Low Bitchburn	14
Newton Cap	22
North Bitchburn	152
Old Butterknowle	6
Pease's West	8
Pensher	22
South Durham	1,832
South Hetton	995
South Kelloe	85
South Moor	285
Tanfield Lea	22
Thrislington	12
Trimdon Grange	229
Total	8,701

Yorkshire Coalfield.

Aldwarke Main	2,783
Alma	15,722
Altofts	6
Barnsley	1,242
Beighton	337
Birley	5,920
Chambers	260
Chapel Town	172
Darfield	264
Darley	153

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YORKSHIRE COALFIELD *continued.*

Names of Collieries.	Tons.
Denaby	56
East Gawber	766
Grange	8
Kilnhurst	7,284
Lund Hill	79
Manvers Main	35
Masboro'	287
North Staveley	77
Oaks	715
Old Silkstone	2,164
Pinder Oaks	135
Rawmarsh	8
Rothwell Haigh	30
Royston	8
Silkstone	340
Sheffield	15
Staveley	13,776
Strafford	2,011
Swaithe	236
Tankersley	23
Thryberg Hall	2,587
Waleswood	575
Waleswood Main	342
Wath	276
Wentworth	3,763
West Riding	2,743
West Staveley	4,116
Wharncliffe	1,052
Wombell Main	1,015
Worsboro'	219
Total	76,550

DERBYSHIRE COALFIELD.

Alfreton	54
Alton	617
Avenue	2,651
Bennerley	4,614
Bretby	9,790
Cadley Hill	1,309
Chesterfield	336
Church Gresley	1,179
Clay Cross	148,444
Coates Park	7,888
Codnor Park	33,829
Denby	384
Dronfield	1,700
Dunston	58
Eckington	53,099
Granville	13
Grassmoor	17,344
Gresley Wood	9,184
Heanor	22,717
Ilkeston	2,302
Kilburn	162
Killamarsh	455
Langley Mill	85,923
Marehay	5,577
Monkwood	872
Newbold	6
New Birchwood	22,156
New Brampton	6,759
New Hill	49
Oakerthorpe	4,322
Pilsley	9,571
Pinton	20,524
Pyebridge	4,542
Renishaw	3,131
Riddings	24,329
Ripley	18,061
Rutland	2,600
Sheepbridge	17,031
Shipley Gate	25,462
Shirland	15,383
Stanton	5,653
Stoneyford	2,261
Swadlingcote	6,997
Swanwick	10,169
Tapton	31,139
Tibshelf	3,359
Unstone	1,065
Upper Birchwood	319
Whittington	15,094
Wingerworth	2,186
Wingfield	303
Woodhouse Close	58
Total	657,980

NOTTINGHAMSHIRE COALFIELD.

Names of Collieries.	Tons.
Annesley	24,202
Basford	414
Babbington	24,837
Cotmanhay	6,506
Digby	2,839
Eastwood	8,564
Hucknall	28,183
Plumtree	3,658
Portland	2,713
Shireoaks	1,752
Skegby	2,232
Teversall	3,031
Total	108,431

WARWICKSHIRE COALFIELD.

Glascote	52
Stockingford	5
Stretton	1,536
Wilnecote	295
Total	1,888

LEICESTERSHIRE COALFIELD.

Bagworth	18
Coleorton	68
Ibstock	488
Leicester	168
Moira	740
Nailstone	16,720
Snibstone	16,735
Swannington	1,131
Whitwick	10,184
Wooden Box	104
Total	46,351

NORTH STAFFORDSHIRE COALFIELD.

Harecastle	50
Talk-o'th'-Hill	1,159
Wichnor	20
Total	1,229

OTHER COLLIERIES AND SUNDRIES.

Bedford	7
Coal (Loco.)	19,804
Devonshire	1,215
Dodsworth	11
Reservoir Pits	256
Saint Helen's	7
Stations	1,151
Whiteboro'	79
Total	22,530

SUMMARY OF COAL BROUGHT TO LONDON IN THE YEAR 1870.

Coalfields.	Quantities.
	Tons.
Durham and Northumberland	8,701
Yorkshire	76,550
Derbyshire	657,980
Nottinghamshire	108,431
Warwickshire	1,888
Leicestershire	46,351
North Staffordshire	1,229
Other Collieries and Sundries	22,530
Total	923,660

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APPENDIX No. 125.

GENERAL SUMMARY of COALS and COKE brought by RAILWAY and CANAL within the LONDON DISTRICT.

——	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
Great Northern Railway	396,561 18	547,602 11	591,434 16	531,819 16	524,711 6	431,500 18	502,813 14	537,225 10	415,812 13	550,908 0	803,169 10	975,509 0	1,006,277 0	1,044,125 0	938,405 0	911,839 0	978,049 0
London and North-Western Railway	271,010 19	339,656 19	443,672 7	476,096 10	481,449 17	533,730 9	693,418 16	743,542 4	666,131 2	759,763 8	961,697 1	1,093,725 15	1,188,996 12	1,243,390 9	1,059,177 13	758,719 13	835,281 6
Midland Railway	—	—	—	—	5,745 10	39,570 0	58,490 0	69,329 0	156,362 0	165,984 13	137,340 7	152,737 1	156,645 16	157,246 12	183,701 9	759,982 18	923,660 0
South Western Railway	—	827 11	102 15	17,005 0	9,353 6	9,917 5	17,589 3	14,290 9	18,349 11	19,900 7	20,349 5	19,950 2	21,072 0	23,455 13	22,731 10	25,134 9	27,560 7
Great Western Railway	84,592 0	86,950 0	73,048 0	69,805 0	62,720 10	51,882 0	63,944 0	95,045 0	93,276 0	110,440 0	191,931 0	237,223 0	367,906 0	425,715 0	442,450 0	443,589 0	470,852 13
Great Eastern	167,957 18	145,327 4	126,775 9	101,293 4	91,901 15	102,651 13	121,225 16	156,220 4	150,854 0	160,323 3	197,353 6	232,501 4	212,467 16	388,432 16	316,408 19	431,885 8	507,344 9
Hertford, Luton, and Dunstable	—	—	—	—	1,927 0	7,787 2	4,416 19	7,787 14	—	—	—	—	—	—	—	—	—
London, Chatham, and Dover Railway	—	—	—	—	—	—	—	1,576 3	5,126 0	7,569 13	11,744 6	11,894 16	6,156 11	4,324 13	4,546 13	4,293 0	4,572 1
London, Tilbury, and Southend Railway	—	—	—	272 0	505 0	508 0	958 0	1,159 10	645 0	586 0	639 0	707 0	638 0	427 0	589 0	750 0	262 0
London and Brighton Railway	—	—	—	76 0	534 0	731 0	104 0	—	—	—	—	—	—	—	—	—	25 14
South Eastern	23,934 0	23,471 2	11,265 17	10,008 3	11,571 1	12,801 1	14,585 8	16,691 3	6,337 16	—	17,716 14	8,809 14	9,734 14	9,555 5	11,323 3	10,402 8	10,482 2
Total by Railway	945,056 15	1,137,835 7	1,246,299 4	1,206,775 13	1,190,421 5	1,191,109 8	1,477,545 16	1,642,866 17	1,513,894 2	1,775,497 4	2,342,440 9	2,733,056 12	2,969,896 9	3,295,652 8	2,979,333 7	3,341,565 16	3,758,089 12
Grand Junction Canal	32,153 19	23,250 13	25,401 0	26,296 15	20,224 10	16,964 10	19,593 0	18,217 0	11,553 0	9,226 0	8,902 10	8,532 5	10,176 10	9,965 10	8,903 5	6,928 10	7,301 12
Vià River Lea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	613 5	—	—
Vià River Thames (Weybridge)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11 0	13 9	—
Totals by Railway and Canal	977,210 14	1,161,086 0	1,271,700 4	1,233,072 8	1,210,645 15	1,208,133 18	1,497,138 16	1,661,083 17	1,524,947 2	1,784,713 4	2,351,342 19	2,741,588 17	2,980,072 19	3,305,617 18	2,988,860 17	3,348,526 15	3,765,391 4

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Appendix, Tables No. 126.

Shipments of Coal from the several Ports of Great Britain to Foreign Countries, indicating the Foreign Ports at which the Coal has been received. The English shipments are divided into the several Ports representing special Coalfields as follows, and London :—

1. The Northern Ports comprise the coal shipped at Newcastle, Shields, Blyth, Amble, Sunderland, Seaham, Hartlepool, Stockton, Middlesbro', Whitehaven, and Maryport.
2. The Yorkshire comprises the coal shipped at Hull, Grimsby, and Goole.
3. The Lancashire the coal shipped at Liverpool and neighbouring ports.
4. The Western comprises the coal shipped at Bristol, Cardiff, Swansea, Newport, Llanelly, Port Talbot, Neath, and St. David's.
5. The Scotch comprises the coal shipped at Glasgow, Port Glasgow, Greenock, Grangemouth, Alloa, Borrowstoness, Troon, Ardrossan, and Inverkeithing.
6. London.

No. 1.—Coal Exports from Northern Ports during the under-mentioned Years.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE.						
Abbeville	2,077	2,881	2,045	1,532	1,869	2,162
Agon	..	..	109	503	..	..
Angus	..	1,003	..	..	..	..
Auray	146	476	252	264	413	460
Azier	512	..	..	..	..	..
Basse Indre	2,128	1,532	450	170	120	310
Bayonne	7,992	11,340	10,901	6,841	8,589	8,847
Belle Isle	..	..	148	..	..	..
Benic	..	..	..	..	159	159
Billiers	..	..	..	..	130	..
Blaye	205	..	..	..	..	180
Bordeaux	84,526	83,074	88,816	90,035	85,803	68,780
Boulogne	63,805	59,134	78,589	67,466	85,022	70,752
Bourganeuf	..	..	227	114	..	..
Brest	16,426	11,615	5,044	7,596	7,006	7,196
Caen	38,029	51,610	44,877	36,266	49,392	55,561
Calais	31,658	26,752	20,676	21,203	67,228	57,413
Callas	..	..	127	..	..	..
Caudebec	349	414	135	..	223	395
Cannes	..	..	..	..	..	1,226
Carentan	304	396	1,472	1,153	1,686	3,089
Cette	2,001	1,258	2,075	357	474	..
Chantenay	..	..	120	90	160	104
Charente	7,004	9,144	7,758	7,467	9,964	11,117
Chateau	..	..	..	367	100	60
Cherbourg	13,059	12,490	9,076	9,142	8,362	9,541
Coneron	..	117	..	..	745	1,118
Conquet	549	1,161	1,162	1,744	1,477	880
Controul	..	..	..	..	90	..
Courseulles	272	531	1,038	759	1,077	2,040
Croisset	276	..	154	..	..	..
Croisic	..	564	246	269	..	..
Crotoy	1,455	856	135	110	160	408
Daoulas	..	..	..	..	188	..
Dieppe	114,247	122,332	86,875	88,563	130,293	109,406
Dieppedale (Rouen)	..	..	209	470	..	..
Dinan	..	..	50	..	..	..
Dives	121	81	128	254	416	631
Dournenez	90	..	..	..	..	111
Duelaic	..	..	..	..	200	..
Dunkirk	33,907	30,240	17,814	25,359	63,754	49,857
Etaples	334	408	647	255	321	117
Eu	2,535	2,673	659	1,006	2,787	1,725
Fecamp	9,782	16,389	21,066	20,139	19,960	16,787
Fresne	..	..	..	..	..	150
Granville	4,650	4,609	4,434	5,724	5,290	4,303
Gravelines	1,045	1,842	6,374	6,902	14,508	16,535
Gironde	..	..	..	..	..	135
Harfleur	4,628	6,120	3,183	4,155	5,228	2,328
Havre	121,684	111,887	115,086	110,558	116,869	98,069
Hennebout	414	509	766	2,024	541	330
Honfleur	15,686	11,964	22,580	42,416	27,801	20,686
Indredt	845	1,157	..	..	..	..
Isle Dieu	..	150	..	..	..	..
Isle D'Oleron	..	..	114	..	..	..
Isle de Rhe	244	80	..	..	..	..
Isigny	404	790	1,223	871	820	466
L'Orient	9,043	6,780	6,514	3,868	3,707	3,868
La Legue	..	..	..	..	..	159
La Rochelle	5,615	15,996	6,894	5,083	6,727	6,137
La Seyne	..	..	..	..	239	225
La Tremblade	1,163	1,080	575	121	64	85
Le Ciotat	..	307	..	..	..	..
Le Moule	321	..	697	..	1,314	1,696
Le Sables	..	..	..	150	..	..
Le Vivier	350	137	545	451	173	..
Les Monnards	..	..	..	..	117	..
Landerneau	542	447	437	122	230	496
Lannion	142	297	..	415	114	241
Lannoy	508	..	..	..	..	..
Libourne	1,562	1,182	1,767	1,918	1,326	2,440
Luc	317	142	156	525	..	74
Lucon	1,598	800	1,078	564	1,973	1,532
Luc-sur-Mer	..	..	..	80	..	..
Marans	135	1,044	1,268	597	1,166	1,390
Marennes	196	140	..	..	..	250
Manbert	..	121	130	546	100	324
Marseilles	..	16,988	9,955	6,421	6,065	7,548
Means	..	72	283	275	..	..
Montaign	..	..	..	..	114	..
Morlaix	1,296	3,833	..	2,719	2,099	3,019
Morique	70	361	117	170	244	349

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE—*cont.*						
Mortagne	241	365	238	410	662	525
Nantes	39,255	41,226	29,230	28,642	24,510	19,149
Noir Moateur	..	..	70	..	..	..
Nice	..	..	..	3,184	..	..
Orthes	..	..	..	..	..	190
Paimboeuf	1,160	399	2,850	316	255	310
Paimpol	..	81	..	..	..	..
Paris	..	..	..	..	..	100
Perros	..	..	379	..	..	..
Plaucoet	..	..	..	..	..	90
Point-aux-Herbes	450	833	352	756	100	462
Pont-au-de-Mer	326	466	2,566	564	2,146	2,042
Ponterson	..	..	..	714	455	225
Pontrieux	..	93	146	..	85	..
Pornic	106	116	130	318	140	341
Pont-au-Bessin	1,230	1,753	2,822	2,590	3,178	2,627
Port Launnay	117	898	1,219	760	..	108
Port Louis	..	..	230	..	..	..
Port Vendres	207	..	296	..	151	..
Pouliguen	740	206	329	352	..	270
Quiberon Bay	127	..	..	130	..	..
Quillebœuf	2,152	740	1,306	..	212	698
Quimper	111	171	457	223	778	143
Redon	3,188	765	542	462	495	654
Regneville	..	..	186	294	380	197
Riberon	..	96	141	405	560	225
Roche Bernard	132	128	135	75	470	..
Rochelle	..	..	..	1,506	..	..
Rochfort	9,472	7,499	7,466	3,606	3,901	3,337
Roscof	..	..	..	..	455	..
Rouen	61,760	71,136	62,363	50,200	66,997	16,642
Royan	..	..	..	..	538	420
Sables	..	..	..	..	362	..
Sables d'Olonne	584	342	1,361	684	1,044	1,307
St. André-de-Culsac	..	236	..	..	..	..
St. Brieux	1,547	1,647	2,239	2,450	3,111	3,035
St. Croix	..	996	1,346	..	518	402
St. Gilles	..	105	106	346	311	780
St. Malo	17,958	14,964	17,550	18,727	23,116	25,627
St. Nazaire	5,005	4,339	9,019	8,542	8,659	11,635
St. Vaas	259	..	..	..	..	..
St. Vaast	..	494	646	233	444	609
St. Valery	..	..	..	..	4,415	6,295
St. Valery-en-Caux	..	2,187	3,495	2,685	..	..
St. Valery-sur-Somme	7,725	7,963	4,568	2,997	9,723	6,991
St. Servan	702	191	1,161	2,602	698	597
Surte	..	..	..	452	..	..
Thornville	..	..	130	..	..	..
Toulon	1,990	2,071	3,925	1,705	656	1,017
Treguier	..	65	..	1,019	898	902
Treport	4,145	4,897	4,978	3,588	4,566	4,518
Trouville	2,565	2,898	3,259	3,080	10,415	19,588
Vannes	350	716	559	794	1,546	1,172
Ville-de-Conde	140	..	..	..	..	..
Ville d'Eu	63	..	212	473	101	..
DENMARK and the DUCHIES.						
Aalborg	2,109	4,526	7,090	6,778	6,452	8,553
Aarceskoping	..	..	214	..	21	..
Aarhuus	2,468	3,154	4,078	3,460	6,063	8,567
Adlersborg	..	..	..	..	109	167
Allinge	..	..	..	..	334	..
Altona	36,710	34,670	34,397	38,471	23,200	24,013
Apenrade	..	229	540	317	567	332
Arnis	..	..	..	278	146	150
Assens	1,071	1,334	1,085	1,779	1,374	..
Ballum	..	..	183	106	106	161
Bandholm	120	414	233	276	567	1,155
Bjorkboda	..	..	811	..	..	..
Blockhade	..	85	..	..	..	..
Blankenese	..	461	..	..	340	518
Blokhuus	..	27	..	..	..	..
Bogense	..	180	440	342	424	598
Bornholm	..	..	282	239	106	..
Brested	..	69	64	..	..	..
Brunsbuttel	..	1,014	717	240	104	..
Busum	..	..	371	..	84	..
Cappeln	..	367	771	154	394	678

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No. 1.—Coal Exports from Northern Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1863.	1864.	1867.	1868.
Denmark, &c.—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Catinsiel	..	..	98	..	..	195
Copennagen	68,263	67,811	90,073	96,378	120,165	123,244
Delve	..	469	361	284	135	101
Eckenforde	..	615	755	1,091	762	1,226
Ebeltoft	..	69	..	..	148	120
Eroeskjobing	..	..	58	..	98	305
Eldenserdammersell	..	..	..	..	100	..
Elmshorn	..	370	96	149	..	..
Elsinore	59,649	42,522	84,412	110,113	108,705	128,449
Enzrombrera	..	..	..	..	..	2,117
Faaborg	451	307	273	784	594	900
Fanoe	..	353	340	253	639	230
Faroe	..	..	..	..	103	..
Faro Sound	..	..	..	616	..	..
Faxo	..	..	..	..	109	291
Fehman	..	706	..	395	..	..
Fehmern	..	..	914	1,100	2,085	2,427
Fleckenford	..	..	..	..	109	..
Flensborg	4,116	5,896	7,796	3,279	7,178	10,602
Fohr	..	160	801	299	643	300
Fredericia	371	1,559	887	916	1,979	2,149
Frederikshaven	332	853	1,249	1,647	884	1,736
Frederickstadt	..	1,026	1,450	1,645	1,128	1,496
Fredericksund	..	586	722	175	543	553
Fredericksvoerk	..	1,187	1,068	1,052	1,349	992
Garrucha	..	1,111	4,343	2,923	1,289	1,947
Gluckstadt	3,749	2,204	12,120	4,297	5,485	15,622
Gravenstein	..	..	..	..	..	170
Grennaae	..	..	339	80	199	578
Hadersleben	1,880	3831	2,204	225	1,293	699
Hadersley	..	..	..	352	..	..
Hadsund	..	..	..	127	222	74
Hasle	..	..	..	..	96	..
Heide	..	..	85	..	..	..
Helingenhafen	..	539	671	1,070	533	351
Heppens	..	1,346	1,690	2,347	4,156	3,303
Heslingen	..	..	661	..	..	..
Hielsminde	..	..	585	..	170	..
Hjarbeck	..	946	1,063	442	..	..
Hjerting	..	184	68	..	..	66
Hjorring	..	..	..	..	..	29
Hobroe	..	878	702	740	1,002	673
Holbeck	1,164	1,100	1,314	455	979	1,590
Holme	..	..	..	..	153	..
Holrois	..	..	..	..	90	..
Holstein	..	..	..	..	66	..
Hornphaw	..	..	..	151	..	..
Horsens	1,225	2,332	2,741	2,491	2,348	2,996
Hourdehl	..	170	..	111	..	..
Howacht	..	397	265	330	577	304
Hoyer	..	743	1,109	393	535	417
Husum	..	566	467	64	1,061	646
Itzehoe	2,384	6,699	7,453	8,954	19,174	6,094
Kallundborg	..	285	707	630	512	592
Karrebecksminde	716	319	286	366	774	1,359
Kastrup	..	1,595	1,749	1,921	2,167	4,018
Kiel	12,190	11,088	15,198	5,578	17,680	26,129
Kjertsminde	..	308	236	158	204	394
Kjerting	..	..	68	..	..	..
Kjoge	..	1,481	2,380	880	1,694	2,878
Kolding	746	1,145	1,366	927	1,345	965
Kongelf	..	..	..	..	130	..
Korsoer	5,340	9,171	13,230	16,995	16,779	21,963
Kotingsiel	..	..	..	135	487	..
Krik	..	..	..	..	..	114
Langore	..	..	..	..	..	105
Langeland	..	..	..	..	119	..
Lemkenhafen	..	66	271	..	..	..
Lemvig	..	213	288	182	232	180
Logstor	..	203	583	256	250	494
Lokken	..	295	612	212	224	374
Lonstrup	..	337	142	29	77	64
Lysekehld	..	..	148	..	..	..
Lysterdyb	..	..	..	249	..	..
Mariager	..	207	463	..	137	661
Mariboe	..	..	85	..	..	..
Meidorf	..	..	1,622	995	942	706
Mem	..	109	..	153	..	432
Middlefahrt	..	148	260	560	408	237
Mullerup	..	..	..	103	..	130
Nakskov	451	594	1,549	1,658	1,121	1,407
Nestved	..	909	1,284	878	1,223	1,505
Neufeldt	..	64	101	68	240	174
Nevais	..	..	223	..	..	..
Nexoe	..	..	106	..	234	..
Nibe	..	395	539	109	..	191
Nivaa Baya	..	..	..	..	..	90
Nordborg	..	..	..	..	127	225
Nyborg	466	914	1,518	2,711	3,985	5,562
Nyekjobing	2,334	4,213	3,451	2,003	2,393	3,188
Nymin-de-Gal	..	..	..	..	484	92
Nysted	..	228	53	..	231	213
Moss	..	..	..	..	..	170
Odense	2,153	4,081	4,376	4,735	4,127	5,914
Pahlude	..	..	..	165	397	90
Pelworom	..	..	..	192	..	44
Prestoe	..	187	429	300	414	425
Randers	2,201	4,423	6,736	5,653	7,582	6,389
Rendsborg	2,928	2,940	3,781	2,314	3,349	4,942
Resingard	..	89	..	..	..	172
Ribe	..	637	684	875	1,135	280
Rinkjobing	..	167	102	257	464	463
Rodvighaven	..	..	509	551	350	278
Roeskilde	687	1,001	865	1,185	1,786	1,655
Romo	..	..	..	96	..	..
Ronne	..	791	2,008	2,071	1,328	652
Rorvig	..	111	263	206	387	313
Rudkjobing	1,231	312	554	613	617	817
Rungsted	..	..	226	..	..	..
Rydebeck	..	..	180	..	..	..
Sajobing	..	127	..	..	..	..
Samsoe	..	101	276	..	..	92
Saxjobing	..	..	..	63	297	340
Schlei	..	..	..	..	105	..
Schleswig	..	223	660	161	803	1,094
Schulpersiel	..	412	266	245	61	197

Name of Country and Port to which exported.	1858.	1860.	1863.	1864.	1867.	1868.
Denmark, &c.—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Skagen	..	..	..	..	511	..
Skive	..	360	1,426	160	694	569
Skjelsker	493	530	939	1,061	314	668
Skobjobing	..	..	201	..	..	..
Skodborg	..	..	..	..	..	226
Skurn	..	..	246	..	..	..
Soevig	..	..	..	..	..	186
Sonderborg	..	895	1,270	1,426	981	885
Stege	..	461	300	262	345	561
Stenbury	..	..	..	163	..	..
Store Heddinge	..	280	..	..	..	..
Struer	..	468	564	265	267	148
Stubbeckjobing	..	244	465	255	602	586
Suderstapie	..	..	..	218	..	..
Svanike	..	..	85	146	175	225
Svendborg	215	868	1,017	1,295	1,587	1,618
Sylt	..	..	61	..	90	273
Thisted	600	1,195	2,016	1,097	1,049	1,577
Thornebye	..	27	19	..	21	..
Thorshavn	..	..	..	13	..	..
Tomby	..	..	..	..	..	27
Tondun	..	125	79	173	..	..
Tonning	2,477	1,910	6,018	8,766	13,880	17,727
Utersen	..	..	..	..	1,981	913
Warde	..	..	..	233	..	135
Warverost	..	85	..	..	..	..
Wedbeck	..	..	135	..	..	170
Welle	106	1,013	1,727	1,083	1,226	1,698
Whroden	..	..	..	..	210	80
Worden	..	..	..	190	333	147
Wordingborg	..	371	739	1,027	1,464	1,276
Wornerhafen	..	51	121	210	..	..
Wyck	..	349	85	478	365	289
Wyckauf Fohr	..	166	..	73	..	53
Other Ports	19,266	..	..	..	..	..
NORWAY.						
Aalesund	1,720	498	771	1,664	2,079	2,393
Aasgaardstrand	..	..	..	231	80	169
Alten	..	1,161	1,128	541	3,788	2,254
Altongaard	..	..	..	266	..	..
Arendhal	..	979	453	795	1,413	979
Bergen	5,243	2,219	4,891	4,861	11,464	1,894
Bodoe	..	..	1,069	3,231	696	3,468
Brevig	..	591	546	590	483	1,047
Christiania	12,783	20,713	15,863	17,701	27,091	24,761
Christiansand	2,981	1,138	4,518	9,055	9,609	3,410
Christiansund	572	199	63	316	941	1,936
Dram	1,708	347	34	390	254	..
Drammen	742	2,444	2,415	1,442	3,996	3,998
Drobaek	..	117	127	..	..	649
Drontheim	3,907	4,584	7,330	9,529	10,313	9,397
Egersund	..	175	186	880	1,330	..
Farsund	..	..	53	..	..	..
Flekkefiord	..	..	88	..	218	16
Fredericksheld	1,061	1,274	626	531	1,303	1,703
Fredericksvoern	..	..	..	280	..	..
Frydenhand	..	..	127	..	..	..
Grimstadt	..	96	..	199	533	189
Hammerfest	536	3,855	3,976	3,063	3,269	3,254
Hammersiel	..	..	..	..	..	64
Hangesund	..	..	64	117	..	161
Haunebrostrand	..	..	..	83	..	..
Holmstadt	..	441	127	..	139	..
Holmstrand	..	457	214	317	313	189
Horten	1,937	2,926	3,515	6,263	4,413	3,962
Jessefjord	..	..	196	..	..	..
Krageroe	..	126	137	391	702	723
Krautsand	..	441	814	2,531	5,789	6,969
Langesund	..	..	145	146	189	..
Laurvig	3,568	2,486	1,409	2,774	1,936	462
Lertholm	..	..	149	..	..	..
Lillesand	..	127	33	84	217	186
Loffoden	..	..	..	..	..	197
Mandhal	..	183	139	1,933	953	773
Molde	..	418	348	..	556	231
Moss	590	1,114	567	557	1,139	..
Namsas	..	..	42	..	..	..
Oster Risoer	..	397	84	105	393	..
Porsgrund	..	151	206	605	547	155
Reckefford	..	..	..	24	..	..
Rusoer	..	..	..	..	43	182
Sandifjord	..	123	176	169	563	472
Sarpsborg	..	95	180	126	170	..
Saltbek Bay	..	..	..	..	..	1,016
Skien	..	83	552	901	357	655
Soggendahal	..	..	..	..	80	..
Soon	..	223	..	136	..	..
Stathelle	..	63	..	11	..	..
Stavanger	1,169	2,150	1,918	1,174	2,248	2,926
Tonsberg	651	1,210	634	979	728	694
Toopeyand	..	..	109	..	..	..
Tromsoe	778	694	1,916	1,254	1,575	980
Tvedestrande	..	84	21	42	42	111
Vardoe	..	..	136	..	210	300
Wadsoe	..	201	154	1,173	1,064	1,187
Wardoe	..	..	209	..	286	12
Other Ports	3,119	..	..	..	..	..
SWEDEN.						
Ahus	..	1,684	2,000	770	1,641	880
Arboga	..	..	..	190	..	..
Bastadt	..	93	200	211	180	117
Calmar	..	449	860	780	1,377	1,985
Carlscrona	1,603	1,261	1,975	4,013	3,250	5,659
Carlshamn	..	1,583	1,270	726	980	339
Christianstadt	..	60	..	170	..	..
Cimbritshamn	..	385	719	895	817	537
Engelholm	..	347	578	263	356	686
Falkenborg	..	..	..	306	191	175
Fjabacka	..	..	188	..	..	..
Gefle	..	2,534	1,493	2,026	613	5,797

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No. 1.—Coal Exports from Northern Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Sweden—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Gevesdorf	..	..	..	..	263	..
Gottenborg	51,797	63,145	67,340	74,605	94,946	86,104
Gothland	..	..	..	130	..	..
Gunnibo	..	..	..	..	1,791	3,233
Gustafsborg	..	573	300	..	307	..
Halmstadt	..	..	597	..	1,157	1,515
Helsingborg	1,099	2,581	4,819	4,451	3,468	4,028
Hernosand	..	553	..	..	..	302
Holmstadt	..	154	..	997	316	..
Hudiksvall	..	69	..	107	468	..
Kallenfjarden	..	424	..	..	..	..
Kallerofjarden	..	..	339	1,227	519	286
Kallundofjarden	..	212	..	..	..	..
Kulley	..	..	..	212	..	..
Landscrona	4,606	5,963	1,063	10,763	12,739	10,196
Oregrund	..	..	..	..	..	339
Lerbaholm	..	..	..	211	..	111
Lommo	..	..	..	..	294	..
Malmo	10,500	17,623	24,819	24,700	23,911	29,338
Marstram	..	..	..	..	..	127
Monsteras	..	..	..	..	159	..
Norberg	..	..	119	..	..	185
Nordkjobing	..	..	229	..	339	..
Norkoping	6,616	12,498	9,191	7,872	9,645	13,142
Nykoping	2,333	3,495	3,975	..	392	1,035
Oscarhamn	..	250	..	435	346	1,475
Ronneby	..	..	175	..	..	..
Skeppsvid	..	..	..	..	330	..
Slito	..	..	..	..	363	..
Soderhamn	..	..	63	..	577	146
Sodutelge	..	..	..	42	158	109
Solvitsburg	..	139	146	530	223	371
Stockholm	35,341	37,799	45,763	34,999	35,685	46,095
Stora	..	222	..	..	350	519
Strandmollen	1,665	3,567	2,758	3,450	2,520	2,164
Solstradtrom	..	..	..	..	..	66
Stromstadt	..	575	440	816	180	500
Stromshold	..	..	..	..	..	330
Sundsvall	..	1,225	254	200	840	1,496
Swartwick	..	..	329	..	..	..
Trelleborg	..	396	1,153	1,616	2,057	4,062
Tindered	..	805	..	717	..	122
Uddevalla	1,637	2,811	1,709	1,545	5,070	4,540
Umea	..	198	..	..	..	..
Waldermarsvic	..	..	..	..	52	53
Warberg	..	128	..	1,110	522	412
Wefelsfleth	..	..	..	..	144	266
Weanersborg	..	..	146	822	330	..
Westeras	..	..	..	..	423	..
Westerwick	..	106	490	1,567	676	1,814
Westmano	..	..	..	..	94	..
Wisby	..	169	257	616	1,920	2,607
Ystadt	1,371	2,859	4,677	3,675	6,960	6,237
Other Ports	5,873	..	..	..	..	..
Russia.						
Abo	..	85	244	..	462	1,206
Alexandrowski	..	..	..	851	..	..
Archangel	..	42	2,552	920	460	963
Asoff	..	..	..	..	641	..
Bateum	..	..	..	2,499	819	1,100
Bjorneborg	..	106	..	465	..	480
Bolderas	..	..	..	..	180	392
Borgo	..	143	368	..	..	..
Brahastadt	..	207	..	..	..	..
Cronstadt	145,942	168,681	206,874	233,914	250,268	266,286
Dago	..	560	336	470	329	384
Dahlsbruk	..	1,306	1,064	710	1,908	775
Ekenas	..	..	..	..	154	..
Finland	..	..	..	..	392	..
Frederikshamn	..	210	175	..	..	169
Hassall	..	..	..	..	..	207
Helsingfors	1,589	2,528	4,310	4,024	3,687	10,611
Kalbriga	..	..	..	..	329	..
Kertch	..	..	2,012	1,359	1,095	1,445
Libau	..	917	998	1,554	1,361	1,197
Narva	615	2,133	1,910	256	1,150	2,304
Nicholastad	..	..	..	..	..	210
Nicoloeff	..	..	146	..	599	2,711
Odessa	23,117	28,353	27,254	27,350	63,511	38,530
Pornau	..	..	..	..	1,018	2,033
Port Kunda	..	..	..	..	249	..
Rikjavick	..	..	..	..	..	217
Revel	746	1,505	1,817	1,962	3,460	3,300
Riga	12,800	16,454	27,728	30,516	29,568	41,464
St. Petersburgh	15,398	3,672	7,059	3,669	25,055	25,806
Sebastopol	..	..	..	..	1,578	700
Soukgoumkaleh	2,579	..	..	..	..	..
Taganrog	..	..	..	..	..	1,582
Theodosia (Crimea)	1,464	551	..	..	..	329
Uleaborg	..	..	..	100	..	..
Wasa	..	1,786	..	607	..	..
Wiborg	..	950	1,992	1,741	632	1,411
Windau	..	..	170	142	626	..
Other Ports	4,575	..	..	..	..	..
Austria.						
Cattaro	..	..	437	..	..	..
Fiume	912	799	458	906	366	1,284
Pola	786	760	..	..	..	..
Ragusa	..	..	..	..	1,866	..
Spalatro	..	..	..	360	339	342
Trieste	7,870	11,582	6,568	17,379	15,463	14,714
Venice	20,911	23,574	13,900	27,306	26,975	2,556
Other Ports	2,175	..	..	..	..	..
Germany.						
Acumersiel	..	..	74	74	..	..
Altenbruak	..	103	179	..	..	..
Benserseil	..	80	..	..	63	146

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Germany—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Besserup	..	..	177	..	..	200
Brake	26,556	33,055	12,280	4,614	5,945	8,535
Bremen	3,263	5,249	1,759	785	853	696
Bremerhafen	5,792	4,553	2,510	2,236	5,001	5,554
Brunshausen	..	120	408	2,724	1,534	2,016
Buxtehude	..	570	472	..	100	..
Carolinensiel	..	188	69	..	358	259
Connon	..	106	..	..	..	..
Crans	..	384	1,039	641	3,078	2,754
Cuxhaven	1,122	1,341	2,005	2,217	11,339	15,200
Dodesdorf	..	..	64	148	..	..
Dombusch	..	128	..	..	909	1,258
Elsfleth	..	1,177	879	377	260	530
Emden	954	1,211	2,028	1,354	2,459	1,684
Estebrugge	..	100	120	64	90	225
Fedderwardersiel	..	392	167	100	250	260
Freyburg	..	113	190	..	1,130	612
Gaunsieck	3,855	3,033	4,750	3,036	4,642	4,563
Geestemunde	3,223	8,004	6,714	4,843	3,968	2,859
Geestendorf	..	165	180	..	..	88
Greetshyl	..	..	85	..	85	..
Grossensiel	..	413	286	355	..	138
Grunstadt	..	..	..	63	..	..
Halte	..	..	100	..	..	..
Hamburg	444,232	434,662	435,882	452,293	553,758	623,096
Harburg	36,394	23,806	28,033	17,985	19,489	7,883
Hooksiel	..	289	634	216	465	327
Kliensiel	..	207	182	..	..	..
Kliensersiel	..	68	..	..	115	..
Leer	1,979	5,854	7,481	4,296	9,487	7,321
Lube	..	..	..	..	..	116
Lubeck	11,124	16,214	15,278	10,378	13,811	19,024
Mariensiel	..	183	171	112	1,152	1,286
Meryn	..	..	..	379	..	..
Neuhaus	..	652	793	1,215	2,232	1,866
Neuharingsiel	..	..	..	93	..	..
Neumayen	..	..	..	..	130	148
Neustadt	1,178	1,190	2,244	330	1,638	813
Norden	1,122	1,828	1,250	729	1,665	1,966
Norderhaven	..	480	..	..	..	144
Oberndorf	..	164	370	2,017	1,746	1,790
Oldenburgh	..	93	..	..	..	190
Oldersund	..	245	..	..	..	..
Oltendorf	..	..	119	..	..	360
Otterndorf	..	64	467	287	245	..
Overwerdersiel	..	330	..	..	160	70
Pagensand	..	95	..	..	659	138
Papenburg	..	80	432	207	72	199
Papenburgsiel	..	66	..	..	..	..
Rothenkirchen	..	..	..	..	..	84
Rounebeck	..	197	85	..	..	..
Rostock	5,338	7,675	8,282	7,276	6,543	7,852
Rustersiel	..	..	106	..	..	125
Sarsted	..	272	..	..	..	..
Stade	2,452	3,109	3,748	1,777	5,064	5,832
Steinhausersiel	..	667	415	252	120	925
Schwarzenhutten	..	..	..	..	..	95
Strouhanrersiel	..	119	446	248	276	160
Travemunde	722	270	1,132	126	362	829
Varel	11,149	11,450	12,789	8,544	6,438	4,603
Vegesack	..	743	662	90	311	447
Waddersell	..	..	..	..	109	110
Weiner	..	..	492	536	644	461
Wischaven	3,931	5,642	10,604	4,467	3,739	5,524
Wismar	14,077	10,636	18,809	10,917	15,200	14,350
Westeraccumersiel	..	..	..	..	64	..
Witmund	..	84	164	93	95	..
Other Ports	9,198	..	..	..	..	..
Prussia.						
Anclaim	..	..	..	75	..	..
Burg	1,008	848	484	843	227	614
Colberg	4,415	1,490	5,734	2,640	3,439	2,658
Dantzic	38,504	46,036	63,263	54,863	63,233	41,784
Elbing	..	..	..	110	..	..
Fairwater	1,039	1,376	504	6,126	9,011	16,835
Fischausen	..	..	..	..	..	150
Greifswalde	3,123	3,589	6,639	2,614	2,010	1,178
Konigsberg	17,839	23,428	31,428	13,982	10,428	7,067
Leba	..	..	..	..	..	240
Memel	18,172	16,186	35,633	15,979	27,476	36,240
New Fairwater	..	692	1,757	4,103	14,017	22,851
Pillau	6,135	4,161	5,959	5,394	6,922	11,835
Rugenwalde	1,199	954	1,542	399	106	106
Stettin	84,927	90,060	114,632	51,987	60,771	93,256
Stolpe	..	..	..	..	70	..
Stolpemunde	..	206	761	663	545	1,423
Schliemunde	..	..	..	..	..	164
Stralsund	9,509	11,212	10,716	6,741	7,365	9,609
Swinemunde	133,339	91,137	108,188	58,956	103,316	103,547
Wolgast	16,794	17,696	16,467	11,074	14,293	13,582
Other Ports	1,695	..	..	..	..	..
Holland.						
Amsterdam	66,697	69,410	35,335	4,228	3,670	1,495
Croningen	..	..	..	..	488	..
Brouwershoven	..	4,427	..	293	..	647
Dekken	..	..	85	..	..	..
Delfshaven	..	2,238	1,670	1,942	1,061	2,125
Delfzyl	..	..	460	367	127	105
Breskins	..	..	..	..	..	233
Dinger	..	74	..	..	..	..
Dokkum	..	..	..	85	..	106
Dordrecht	..	310	172	..	..	..
Dordt	16,822	15,623	23,230	23,352	27,598	18,056
Flushing	6,597	8,254	7,471	7,361	5,459	5,712
Groningen	3,605	3,763	7,101	6,020	6,878	6,519
Halemrjarden	..	..	382	..	..	..
Hamelwaden	..	..	180	120	..	..
Harlingen	5,557	6,227	5,540	5,946	4,639	4,631
Helvoet	..	..	..	318	262	202

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No. 1.—Coal Exports from Northern Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Holland—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Hellevoetsluys	12,004	3,424	868	74	2,300	1,484
Hoorn	..	..	156	..	127	..
Kampen	..	788	..	..	..	..
Leenwarden	..	..	..	..	720	1,418
Limmer	..	..	207	230	..	..
Maasluys	..	468	..	..	201	236
Middleburg	4,484	5,204	2,607	2,850	2,748	2,511
Niewediep	48,951	69,604	52,405	74,347	117,678	115,213
Norderschleuse	..	..	283	..	..	..
Purmerena	..	64	..	..	..	..
Rotterdam	86,523	83,911	69,210	57,173	55,964	50,290
Sappemeer	..	..	..	..	..	108
Schiedam	35,113	31,447	28,186	12,701	13,255	11,650
Temmensen	..	790	1,093	..	517	..
Veendam	..	..	106	..	..	..
Vlaardingen	..	143	98	..	475	719
Vleissingen	..	..	..	..	..	328
Zierickzee	2,205	2,197	2,676	5,329	3,894	5,378
Zwolle	1,897	1,954	1,723	244	96	167
Other Ports	3,719	..	..	..	..	..
Belgium.						
Antwerp	13,956	6,164	364	5,187	58,384	19,101
Bruges	11,013	9,344	3,554	5,225	18,549	9,678
Brussels	..	1,692	..	..	159	..
Ghent	17,481	3,072	35	188	4,338	429
Nieuport	..	746	777	..	5,645	..
Ostend	17,221	13,829	8,600	4,589	42,013	29,128
Phillipville	..	..	..	..	209	722
Termonde	..	45	72	..	370	..
Other Ports	706	..	..	..	..	..
Spain.						
Adra	..	..	281	212	961	350
Aguilas	..	534	150	239	..	..
Algesiras	..	..	..	1,686	..	..
Alicante	23,052	15,479	27,005	12,477	6,581	2,919
Almasaron	..	..	..	318	..	127
Almeira	..	572	646	497	1,481	1,004
Anna	..	..	50	..	..	..
Barcelona	31,508	28,581	29,011	32,012	30,119	31,800
Bilboa	3,429	2,837	4,890	15,484	4,958	4,866
Cadiz	16,145	14,441	23,165	24,994	11,989	15,536
Carril	..	1,094	1,245	731	..	..
Carthagena	10,154	9,861	10,136	13,702	16,575	13,574
Corunna	1,729	3,339	4,437	3,533	2,567	1,947
Denia	..	..	..	..	109	..
Deva	..	332	280	274	..	..
Ferrol	3,735	5,643	6,597	3,905	4,006	5,606
Huelva	..	..	..	83	334	50
Malaga	7,160	12,716	16,785	11,558	14,148	16,381
Metaro	215	360	307	509	329	671
Motril	..	..	1,028	2,268	1,784	4,005
Palamos	..	..	..	365	232	421
Passages	..	207	..	239	84	..
Rosas	..	..	310	175	..	..
Salobrena	..	..	..	..	639	..
San Felix Quixols	..	..	..	..	339	..
San Sebastian	..	1,821	3,735	4,535	232	..
Santander	2,052	4,130	2,568	3,466	2,619	710
Seville	5,585	7,891	15,979	5,049	10,038	10,857
Tarragona	1,298	896	2,867	2,385	2,940	3,675
Torre-del-Mar	530	..	774	503	1,288	2,090
Torrox	..	..	..	..	456	..
Valencia	3,995	3,114	4,184	5,381	5,868	4,833
Vigo	671	1,750	5,970	2,818	631	2,210
Villa Nueva	350	260	310	443	784	466
Villa Nueva-Geltra	..	313	..	..	..	..
Villaricos	..	1,624	2,335	1,450	2,203	2,472
Other Ports	1,847	..	..	..	..	..
Portugal.						
Aveiro	..	..	320	95	212	..
Caminha	..	..	527	..	180	267
Figueira	..	1,191	1,270	894	1,736	1,763
Lisbon	36,963	49,904	59,841	51,136	48,866	45,101
Oporto	13,413	13,213	13,765	12,514	15,799	13,906
Pomeran	..	..	178	..	311	286
Portalegre	..	..	..	140	..	..
Saint Ubes	..	..	..	170	487	939
Villa de Conde	..	..	..	..	..	119
Viana	..	133	1,051	453	1,209	846
Other Ports	1,774	..	..	..	..	..
Italy.						
Agasteria	..	..	..	..	957	971
Ancona	2,095	3,887	26,777	11,290	2,779	1,764
Bari	..	..	607	535	1,799	409
Brindisi	..	392	3,246	1,637	6,458	3,206
Castellamare	4,441	3,601	1,234	3,222	856	821
Civita Vecchia	6,257	7,451	6,157	4,511	8,700	8,507
Gaeta	..	..	1,274	1,076	..	..
Genoa	70,905	97,390	110,934	106,395	89,195	113,605
Ischia	..	..	..	..	..	411
Leghorn	7,064	7,702	11,487	12,762	21,241	25,025
Manfredonia	..	..	3,069	..	..	..
Monaco	..	..	..	..	722	720
Naples	39,250	54,538	63,094	44,842	32,000	23,970
Nice	2,089	2,046	2,690	..	4,664	4,113
Pertusola	..	..	..	..	32	..
Piombino	..	..	..	..	461	702
Reggio	..	..	..	408	303	1,203
Rimini	..	..	525	..	..	720
Salerno	..	..	..	..	1,406	2,570
Savonia	..	..	527	1,628	1,619	..
Spezzia	..	..	3,168	..	395	..
Taranto	..	..	509	..	..	..
Vallo	..	..	..	..	815	..
Venice	..	1,748	3,368	..	14,275	22,801
Villa Franca	..	476	159	..	..	..
Other Ports	297	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Mediterranean Sea.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ajaccio	..	467	..	..	..	..
Bastia	1,231	560	733	178	529	244
Cagliari	896	4,384	7,406	6,946	2,769	8,140
Cephalonia	..	..	..	..	..	296
Catania	..	..	..	..	1,713	2,522
Corfu	5,316	4,593	5,282	4,076	1,945	996
Fano	..	..	92	..	..	130
Gibraltar	11,540	6,651	9,096	6,662	15,765	22,990
Girgenti	919	648	2,373	684	233	286
Licata (Sicily)	..	..	..	273	530	1,603
Majorca	..	..	..	228	..	..
Malta	22,992	13,740	10,990	33,892	22,916	26,181
Marsala	..	472	..	315	733	673
Messina	8,909	8,903	15,534	11,553	7,837	13,797
Palma (Majorca)	553	450	472	1,128	..	..
Palermo	5,366	10,436	16,468	17,165	19,471	22,616
Port Mahon	1,012	498	795	636	783	488
Sicily	..	..	585	..	..	..
Syracuse	..	188	1,147	1,876	506	1,788
Trapani (Sicily)	..	..	..	546	1,290	376
Zante	..	762	..	753	549	..
Other Ports	3,155	..	..	..	..	..
Greece.						
Athens	2,604	4,114	2,397	1,586	5,530	6,770
Chalchis	..	349	..	..	..	..
Paros	..	..	..	..	..	539
Patras	916	539	498	503	1,068	414
Piraus	1,071	..	382	..	1,454	..
Spezzia	..	..	8,567	608	254	5,856
Syra	3,044	2,511	4,503	6,928	278	1,335
Other Ports	427	..	..	..	..	..
Turkey.						
Alexandretta	..	514	..	519	424	..
Antirari (Albania)	..	..	..	..	1,971	..
Beyrout	2,965	2,046	2,268	1,440	2,918	..
Bussorah	..	..	848	..	670	1,771
Canea	..	..	289	..	..	..
Dardanelles	..	..	..	..	488	506
Constantinople	71,333	84,970	65,512	56,473	56,828	75,971
Galatz	2,049	3,259	3,060	3,713	909	18,460
Gallipoli	..	334	758	960	224	..
Ibrail	..	..	228	321	..	..
Kustendji	..	..	..	1,750	340	..
Ragusa	1,105	360	712	506	..	..
Rhodes	787	781	594	..	1,623	..
Salonica	1,856	2,713	2,340	1,348	2,811	1,269
Savonia	..	..	..	363	1,625	2,368
Sinope	..	582	..	..	..	..
Suda	..	..	..	..	2,264	4,767
Smyrna	6,295	1,067	5,842	7,136	4,623	3,083
Sulina	..	..	3,812	2,226	972	2,307
Trebisonde	29	..	580	387	..	..
Valo	..	..	..	..	469	..
Varna	..	..	420	..	..	220
Other Ports	1,256	..	..	..	..	..
Africa.						
Acassa	..	..	..	..	13,787	..
Alexandria	..	43,843	55,029	217,125	118,339	89,759
Algiers	..	8,428	6,672	6,330	8,695	3,108
Algoa Bay	..	..	..	1,262	295	561
Bona	..	..	872	461	756	1,021
Cape de Verds	..	..	626	..	1,675	1,381
Cape of Good Hope	..	3,635	7,277	7,844	7,293	6,142
Cape Town	..	..	2,956	..	..	463
Lagos	..	..	..	..	275	..
Oran	..	1,545	1,292	2,356	2,582	3,232
Phillipville	..	183	..	..	..	180
Port Grande	..	..	..	..	201	..
Port Natal	..	..	..	..	498	..
Port Said (Egypt)	..	..	1,128	2,962	7,304	13,289
Sierra Leone	..	..	1,200	..	..	..
Simon's Bay	..	..	..	1,451	1,657	..
Storah	..	..	228	..	200	..
St. Paul de Loando	..	408	950	426	..	..
Suez	..	220	739	..	..	..
Table Bay	..	..	..	..	..	2,451
Tunis	..	342	..	..	1,020	376
Zaffaran	..	..	..	..	392	..
Other Ports	71,537	..	..	..	..	..
Australia.						
Adelaide	..	..	..	..	..	450
Freemantle	..	..	..	..	200	..
King George's Sound	..	1,002	4,020	7,996	1,282	1,738
Melbourne	..	1,906	..	..	..	..
Port Adelaide	..	..	..	101	..	..
Port Torres	..	421	220	..	1,163	1,351
Sydney	..	..	1,500	..	161	..
Other Ports	8,537	..	..	..	..	..
East Indies.						
Aden	..	15,900	14,635	8,020	40,332	27,561
Anjer	..	..	..	746	..	699
Bangkok	..	..	1,417	..	..	223
Batavia	..	3,975	12,700	5,833	3,975	11,704
Beypoor	..	440	742	..	..	..
Bombay	..	9,999	7,943	9,249	63,891	53,341
Bushire (Persia)	..	..	..	763	396	..

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No. 1.—Coal Exports from Northern Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
East Indies—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Calcutta	..	23,578	13,584	25,646	40,870	24,910
Ceylon	..	1,238	1,055	636	1,411	2,051
Bassein	..	..	..	..	..	429
Chufoo	..	..	..	..	384	723
Cochin	..	..	530	495	1,116	..
Coconada	..	..	..	..	1,125	..
Colombo	..	..	350	..	2,779	1,186
Hong Kong	..	16,531	15,479	22,755	17,399	12,093
Java	..	..	835	1,805	1,150	5,064
Kuima (Celebes)	..	700	..	..	..	..
Kurrachee	..	1,592	1,781	..	..	..
Macassar	..	880	..	..	300	..
Madras	..	6,355	5,663	1,290	9,505	4,763
Manilla	..	..	..	..	..	310
Mauritius	..	663	2,782	931	3,443	657
Moulmein	..	..	..	650	..	..
Muscat	..	..	..	..	1,026	3,645
Negapatam	..	..	..	379	686	1,401
Newchwang	..	..	..	..	156	..
Ourust	..	..	4,927	..	..	3,787
Pangeranorang	..	..	..	..	340	..
Pedang (Sumatra)	..	..	..	..	806	..
Penang	..	1,851	..	..	697	..
Point de Galle	..	32,186	15,481	12,881	31,442	24,057
Port Louis (Mauritius)	..	856	..	1,145	3,365	..
Quilon	..	..	..	..	204	..
Rangoon	..	2,501	..	..	11,516	4,217
Reunion, Isle-de-la-	..	434	..	..	..	..
Plainjanjan (Java)	..	..	..	..	..	1,087
Samarang	..	..	..	811	..	1,796
Shanghae	..	5,496	40,437	30,923	15,174	6,033
Singapore	..	17,537	23,054	23,697	17,054	20,134
Sourabaya	..	2,535	19,924	4,759	4,573	7,407
Sunda	..	..	..	..	769	..
Woosang	..	737	..	..	..	..
Yokohama	..	..	..	..	2,282	1,919
Other Ports	99,435	..	..	..	..	..
WEST INDIES.						
Barbadoes	..	1,086	967	673	782	693
Bermuda	..	2,091	901	1,119	300	1,185
Blize	..	..	463	..	170	150
Bridgetown (Barb.)	..	390	..	..	..	..
Cardenas	..	596	2,721	..	387	..
Cienfuegos (Cuba)	..	..	..	..	967	..
Colon	..	..	..	106	..	..
Cuba	..	356	1,110	469	678	..
Diamant	..	..	..	..	..	191
Fort de France (Gua.)	..	541	..	..	..	148
Grenada	..	..	80	..	..	..
Guadaloupe	..	296	3,656	1,973	6,767	11,584
Havannah (Cuba)	..	12,763	22,466	11,704	8,486	12,781
Haytt	..	..	520	..	..	..
Jamaica	..	21	..	4,091	..	..
Le Moule	..	..	..	..	..	477
Kingston	..	..	..	696	..	..
Marie Galante	..	300	445	..	350	490
Matanzas (Cuba)	..	527	1,090	1,703	1,285	2,527
Martinique	..	986	4,374	3,676	10,991	15,119
Montego Bay	..	..	..	..	..	413
Port-a-Pitre	..	..	..	..	1,758	1,023
Port-au-Prince	..	..	..	..	434	..
Port-de-France	..	..	..	..	150	..
Porto Rico	..	307	..	405	..	..
Sague la Grande	..	..	..	413	546	885
Saint Francois	..	..	..	..	345	567
Saint Jago-de-Cuba	..	1,477	640	3,941	3,831	2,901
Saint Louis	..	..	..	..	426	..
Saint Pierre (Martq.)	..	..	806	127	678	..
Saint Thomas	..	1,107	186	9	190	1,306
Saint Vincent	..	..	..	..	..	356
Santiago-de-Cuba	..	..	..	318	..	..
Trinidad	..	..	212	..	281	376
Trinidad-de-Cuba	..	..	930	..	966	2,099
Other Ports	23,655	..	..	..	..	..
NORTH AMERICA.						
Bangor, U.S.	..	487	649	..	..	..
Belle-Isle	..	634	..	..	..	123
Belize	..	..	..	137	..	..
Beverley, U.S.	..	..	..	1,185	..	..
Boston, U.S.	..	6,899	8,234	2,321	9,011	7,585
Bridgeport	..	551	270	..	339	532
Charleston	..	598	..	..	..	..
Columbia	..	..	..	922	..	..
Davis Straits	..	..	..	..	265	..
Halifax, N.S.	..	..	..	550	..	..
Lymford	..	..	..	..	726	275
Montreal	..	538	14,852	2,059	1,960	5,199
Miramichi	..	..	200	..	..	..
Newhaven, U.S.	..	7,873	2,655	2,119	6,875	3,785
New London, U.S.	..	1,575	..	..	2,239	..
New Orleans, U.S.	..	..	..	2,014	..	..
Newport	..	991	..	..	583	..
New York, U.S.	..	35,453	24,235	9,752	18,206	9,951
Philadelphia	..	3,333	1,076	..	111	..
Portland, U.S.	..	2,272	1,351	..	2,146	1,699
Portsmouth	..	..	..	..	329	..
Providence, U.S.	..	2,950	2,639	..	332	440
Quebec	..	27,527	16,003	18,273	23,359	31,900
Saint Catherine's	..	..	..	..	840	1,169
Saint John's, N.F.	..	..	369	..	..	156
Saint John's, N.B.	..	1,653	1,665	2,650	1,891	1,726
Salem, U.S.	..	901	..	456	719	792
San Francisco	..	890	..	792	3,246	6,251
Savannah	..	290	..	..	3,258	..
Three Rivers	..	..	..	..	382	615
Other Ports	115,147	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
SOUTH AMERICA.						
Arica	..	..	469	950	..	462
Aspinwall	..	..	..	..	310	..
Bahia	..	..	1,178	2,981	3,343	5,931
Bonin	..	154	..	..	..	..
Brazil	..	..	..	223	..	..
Buenos Ayres	..	300	..	..	895	235
Caldera	..	3,962	3,862	4,110	1,350	480
Callao	..	3,279	5,534	10,159	2,060	4,204
Coquimbo	..	..	..	..	3,791	3,516
Curacoa	..	256	..	..	..	..
Demerara	..	1,267	2,443	1,994	607	2,348
Iquique	..	475	..	..	..	803
La Guayra	..	..	..	..	..	207
Maranham	..	..	628	..	..	..
Monte Video	..	3,002	2,086	1,882	3,816	1,578
Panama	..	..	..	1,500	..	..
Para	..	..	580	3,911	3,677	3,680
Paraiba	..	..	..	..	..	382
Paramariba	..	..	..	1,602	909	223
Payta	..	..	..	1,164	..	..
Pernambuco	..	424	1,258	2,206	1,386	2,784
Punto Cabello	..	..	..	140	..	..
Ravenna	..	..	..	806	..	..
Quimper	..	..	..	..	..	125
Rio Grande	..	..	622	..	1,206	477
Rio Grande de Sul	..	53	..	..	..	..
Rio Janeiro	..	17,861	16,279	25,126	17,947	30,411
Santa Catherine	..	302	..	..	188	..
Santa Cruz	..	429	2,551	183	254	509
Santos	..	..	..	..	..	1,607
Surinam	..	117	673	1,095	268	350
Torre-de-Mar	..	..	188	..	514	..
Valparaiso	..	1,606	2,654	7,405	3,236	10,061
Vera Cruz	..	890	1,117	..	615	374
Other Ports	35,769	..	..	..	..	..
CHANNEL ISLANDS.						
Alderney	..	3,185	3,071	3,459	1,562	1,372
Guernsey	..	23,264	25,529	18,963	22,939	23,463
Jersey	..	33,673	34,721	33,859	37,962	33,027
Other Ports	54,735	..	..	..	..	..
ICELAND	..	..	..	316	377	..
Bernfjord	..	..	..	..	551	..
HELIGOLAND	95	..	84	..	..	..
AZORES.						
Horta	..	..	..	297	..	..
Fayal	..	..	..	243	456	..
Saint Michael's	..	456	162	140	162	223
Terceira	..	..	..	214	..	178
Other Ports	87	..	..	..	..	..
CANARIES.						
Canary Island	..	..	254	..	..	..
Palmas	..	..	846	212	241	64
Teneriffe	..	481	1,147	1,042	..	1,224
Other Ports	165	..	..	..	..	..
MADEIRA	455	663	1,062	2,062	..	1,771
Funchal	..	..	..	..	4,985	..
SAINT HELENA	..	..	..	..	1,036	..
ASCENSION ISLAND	..	..	..	..	1,253	..
NEW ZEALAND.						
Dunedin	..	..	250	..	..	..
SANDWICH ISLANDS.						
Honolulu	..	..	..	..	150	..
SOCIETY ISLANDS	1,171	1,049	..	..	..	..

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General Summary of Coal Exported from Northern Ports during the under-mentioned Years.

Name of Country to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France	860,839	867,901	757,679	732,942	930,477	821,997
Denmark	239,264	251,768	368,551	373,919	432,278	487,009
Norway	41,079	54,393	58,467	78,276	105,704	66,721
Sweden	124,458	166,853	189,477	187,572	219,453	240,712
Russia	207,815	230,179	286,781	313,526	388,851	396,879
Austria	33,625	36,715	20,453	46,041	41,971	5,596
Germany	592,637	587,915	576,964	549,088	687,261	704,854
Prussia	326,653	309,095	403,674	236,389	333,219	383,128
Holland	259,263	233,703	239,639	202,090	246,137	229,515
Belgium	60,379	34,792	13,402	13,139	139,667	59,059
Spain	113,555	117,725	169,464	151,302	124,249	126,576
Portugal	52,170	64,441	81,911	65,402	68,750	63,227
Italy	133,396	179,206	238,837	187,306	188,657	214,118
Mediterranean	61,892	51,701	70,910	86,626	77,209	103,066
Greece	8,062	7,504	16,347	5,605	8,614	14,095
Turkey	87,675	76,566	87,313	77,144	85,308	110,462
Africa	71,537	60,604	78,963	240,107	235,411	125,843
Australia	8,527	3,551	5,809	7,997	2,667	3,449
East Indies	99,425	145,674	183,239	185,605	287,685	223,155
West Indies	23,555	23,801	41,538	31,490	40,768	55,102
North America	115,147	145,475	74,188	45,110	77,889	73,188
South America	35,769	35,109	41,524	67,387	51,474	70,727
Channel Islands	54,735	60,123	61,321	56,281	63,363	57,962
Heligoland	95	..	84	..	..	..
Iceland	..	..	..	316	228	..
Azores	87	456	163	894	618	461
Canaries	165	421	2,249	1,254	241	1,268
Madeira	455	663	1,063	2,061	4,695	1,771
Ascension	..	..	..	..	1,253	..
St. Helena	..	..	..	..	1,036	..
New Zealand	..	..	250	..	..	..
Sandwich Islands	..	..	..	..	150	..
Society Islands	1,171	1,049	..	..	..	..
Total Exports	3,592,191	3,756,163	4,069,306	3,915,513	4,813,798	4,686,771

No. 2.—Coal Exports from Yorkshire.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE.						
Abbeville	107	..	85	..	..	..
Agon	..	..	35	..	..	..
Amer	80	..	..	..	..	..
Bayonne	..	556	313	..	501	..
Bordeaux	8,319	10,020	5,417	3,961	6,818	4,459
Boulogne	578	300	1,399	3,569	5,238	4,902
Brest	697	369	953	958	235	..
Caen	1,290	2,846	35	448	720	282
Calais	535	74	382	..	..	..
Cette	..	40	337	1,027	..	512
Charente	..	1,361	157	..	632	170
Cherbourg	444	160	102	403	..	..
Dieppe	39,515	31,749	30,235	28,348	44,359	47,969
Dunkirk	4,167	832	1,954	4,563	6,810	6,200
Fecamp	3,384	2,967	1,315	..	734	439
Granville	40	..	..	..	130	112
Gravelines	603	95	156	40	120	..
Harfleur	..	140	130	..	140	227
Havre	4,314	3,906	8,561	10,105	10,475	7,937
Honfleur	..	246	158	653	..	..
Isle D'Oleron	..	..	..	..	80	..
Isigny	249	..	..	..	..	..
L'Orient	..	74	153	470	411	..
La Rochelle	..	1,138	173	702	419	153
Lannion	..	..	..	251	204	..
Marans	..	..	..	..	150	..
Marseilles	2,133	2,255	4,238	3,122	537	684
Morlaix	548	235	475	138	..	..
Nantes	237	2,005	2,149	1,024	353	725
Nouvelle	190	..	..	..	..	..
Perras	..	..	..	..	39	..
Plancoet	..	..	..	..	60	..
Point-au-de-Mer	..	..	..	..	..	155
Ponteau	..	..	..	86	..	..
Pontrieux	..	..	168	302	258	380
Quiberon Bay	..	..	99	..	..	..
Quillebosuf	100	..	..	..	..	..
Quimper	..	134	..	379	158	..
Rochfort	144	2,385	308	405	225	50
Rouen	16,127	7,672	2,669	7,510	1,787	4,393
St. Malo	..	107	226	83	317	506
St. Nazaire	..	..	163	347	..	..
St. Vaast	..	..	..	..	..	90
St. Valery-en-Caux	..	..	130	..	..	..
St. Valery-sur-Somme	478	..	..	..	..	..
St. Servan	..	..	..	..	..	130
Trouville	..	..	..	..	..	727
DENMARK and the DUCHIES.						
Aalborg	860	1,656	577	1,048	1,655	2,025
Aaroeskoping	..	..	..	..	69	..
Aarhuus	542	1,217	1,546	544	986	688
Allinge	..	..	..	..	..	56
Altona	..	88	436	..	240	..
Apenrade	..	206	57	..	106	125
Assens	..	..	118	55	125	..
Bandholm	..	542	313	460	..	201
Bogense	..	80	..	..	..	193
Bornholm	..	123	150	..	120	..
Brested	..	..	80	..	..	..
Cappeln	..	424	840	120	85	379
Copenhagen	11,303	8,930	11,150	13,253	24,123	28,064
Eckenforde	..	..	126	..	440	372
Elsinore	3,235	1,883	3,257	4,291	9,878	17,308
Faaborg	706	555	356	288	446	178
Fanoe	..	95	195	..	20	..
Faro Sound	..	..	..	150	..	..
Fehmern	..	..	..	..	180	..
Flensborg	1,299	3,784	4,388	961	2,208	1,410
Fohr	..	..	..	82	..	..
Fredericia	..	255	84	300	..	257
Frederikshaven	200	392	..	85	202	453
Frederickstadt	..	..	80	..	..	..
Fredericksund	..	248	445	308	..	..
Fredericksvoerk	..	..	107	..	..	..
Gluckstadt	..	130	..	..	..	..
Grenaae	..	..	..	..	..	152
Hadersleben	130	..	118	142	110	..
Haderslev	..	..	196	283	..	..
Helingenhafen	..	246	180	..	369	..
Heppens	..	..	..	..	..	110
Heslingen	..	180	..	..	..	..
Hjarbeck	..	80	161	..	..	..
Hjerting	..	60	..	..	..	..
Hobroe	..	465	410	..	180	110
Holbeck	50	510	526	574	706	668
Horsens	336	241	527	539	2,083	861
Howacht	..	..	..	160	..	..
Husum	..	..	..	..	63	..
Kallundborg	..	660	150	457	562	170
Karrebecksminde	..	..	286	135	614	113
Kastrup	..	..	..	..	280	..
Kiel	1,551	761	3,450	1,613	2,460	3,551
Kjertiminde	..	96	100	..	20	..
Kioge	..	..	150	147	..	448
Kolding	50	212	60	100	..	157
Korsoer	171	595	275	2,161	1,005	600
Langeland	..	..	..	..	42	..
Lemvig	..	..	..	..	88	..
Logstor	..	..	..	141	..	70
Lokken	..	..	..	140	50	..
Marstall	..	..	118	..	..	..
Nakskov	80	1,207	1,701	597	412	485
Nestved	..	..	248	..	549	65
Newhaven	..	..	85	..	..	..
Nibe	..	..	..	74	..	..
Nivaa Baya	..	..	..	175	..	1,049
Nyborg	267	651	271	706	270	119
Nyekjobing	180	188	250	512	454	665
Nysted	..	..	..	..	63	87
Odense	210	1,144	1,099	1,261	490	510
Praestoe	..	..	..	76	..	..
Randers	440	1,461	296	384	229	168
Rendsborg	..	157	28	..	45	..
Ribe	..	47	..	..	..	..
Roeskilde	530	..	..	..	..	..
Ronne	..	..	374	..	240	435
Rorvig	..	316	368	126	..	..
Rudkjobing	130	95	975	145	450	1,065
Rydebeck	..	..	251	..	..	..
Sajobing	..	..	68	..	..	..
Schlesvig	..	..	8	..	38	..
Skive	..	30	..	..	392	95
Skjelsker	..	414	..	107	75	456
Skurn	..	1,046	..	117	..	..
Sonderborg	..	263	65	..	498	164
Stege	..	40	107	63	..	169
Struer	..	75	..	..	..	..
Stubbeckjobing	..	84	..	84	..	..
Svanike	..	..	..	..	..	190
Svendborg	373	..	290	309	683	181
Thisted	491	151	100	167	115	76
Tonning	3,640	1,793	608	239	283	105
Weile	..	834	412	294	888	993
Wordingborg	..	70	..	127	..	..
Other Ports	2,413	..	..	..	..	..
NORWAY.						
Aalesund	..	..	100	..	..	..
Alten	..	50	..	..	..	..
Arendhal	..	43	365	366	223	383
Bergen	1,321	2,604	1,258	1,299	1,866	2,066
Brevig	..	34	42	..	..	..
Christiania	1,898	1,944	8,020	6,968	11,143	11,539
Christiansand	580	1,884	1,617	583	755	723
Christiansund	90	748	..	..	200	..
Drammen	72	..	139	..	..	344
Droback	..	..	..	76	77	200
Drontheim	..	300	..	334	239	..
Egersund	..	115	..	..	..	6,169
Farsund	..	80	55	83	..	163
Flekkefiord	..	..	..	161	..	27
Frederickshald	159	..	..	160	..	169
Fredericksvern	..	..	..	..	..	210
Grimstadt	..	..	90	..	..	..
Hangesund	..	..	..	101	97	469
Holmstadt	..	..	112	74	..	..
Holmsund	..	55	..	..	..	..

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No. 2.—Coal Exports from Yorkshire—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Norway—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Jessefjord	..	120	273	..	..	..
Krageroe	..	..	..	..	62	96
Langesund	..	..	248	..	..	714
Laurvig	70	122	..	100	290	150
Lillesand	..	..	..	16	..	..
Mandhal	..	..	..	..	..	260
Moss	171	..	..	..	..	200
Oster Risoer	..	..	..	122	153	..
Porsgrund	..	106	..	76	471	713
Sandifjord	..	58	..	..	..	60
Skien	..	44	..	41	60	215
Skudeness	..	..	..	..	72	..
Soon	..	..	..	..	58	..
Stavanger	130	691	565	2,763	1,598	654
Sarnesund	..	..	..	..	..	73
Tonsberg	..	60	105	..	..	..
Tvedestrande	..	261	120	565	551	224
Wardoe	..	..	50	..	..	..
Other Ports	1,574	..	..	..	..	..
Sweden.						
Ahus	..	130	150	..	205	..
Bastadt	..	..	..	125	..	..
Calmar	..	..	532	133	..	232
Carlscrona	..	..	..	..	127	100
Carlshamn	..	93	..	..	..	..
Christianstadt	..	2	..	220	..	267
Cimbritshamn	..	..	..	..	..	275
Engelholm	..	..	75	..	..	90
Fjalacka	..	..	166	..	..	..
Gefle	..	2,060	1,197	2,271	465	2,091
Gottenborg	618	1,493	2,673	2,519	4,460	7,611
Gustafsborg	..	45	380	..	212	..
Helsingborg	340	2,271	3,819	3,170	5,403	2,971
Holmstadt	..	135	..	..	..	..
Hudiksvall	..	..	..	..	160	..
Landscrona	785	769	658	1,718	959	2,092
Malmo	1,545	2,502	3,869	5,275	4,779	13,229
Nordkjobing	..	..	..	..	..	286
Norkoping	135	187	140	..	..	..
Nykoping	..	..	53	260	..	..
Oregram	..	..	..	..	..	135
Oscarhamn	..	..	..	89	154	240
Ronneby	..	..	..	..	..	269
Solvitsburg	..	..	502	..	..	..
Soderhamn	..	199	250	..	..	..
Stockholm	3,477	3,641	857	1,023	3,454	5,955
Stora	..	..	..	..	..	315
Stromsbade	..	..	203	..	..	..
Stromstadt	..	43	71	..	..	..
Sundsvall	..	..	..	393	22	99
Tornea	..	196	..	..	..	..
Trelleborg	..	..	73	80	80	102
Uddevalla	20	582	..	..	..	416
Wennersborg	..	..	..	..	..	130
Westerwick	..	..	..	..	362	1,166
Wisby	..	160	..	155	..	..
Ystadt	110	130	..	..	474	253
Other Ports	1,755	..	..	..	..	..
Russia.						
Abo	..	1,455	1,539	152	..	..
Alexandrovski	..	..	..	20	..	..
Archangel	..	..	209	..	..	..
Bjorneborg	..	..	581	..	..	500
Brahastadt	..	..	104	..	..	..
Cronstadt	11,192	14,057	15,868	23,518	31,506	31,790
Dahlsbruk	..	..	..	..	..	337
Ekenas	..	355	..	..	..	..
Helsingfors	100	137	5	..	92	46
Jacobstadt	..	140	40	100	..	120
Liban	..	180	912	1,166	589	..
Narva	944	1,019	850	395	812	1,985
Odessa	1,330	1,536	5,319	2,161	2,149	546
Revel	..	..	347	128	160	..
Riga	180	1,917	5,651	7,339	2,673	924
St. Petersburgh	18,775	930	2,639	2,959	7,548	9,465
Sebastopol	..	..	..	776	..	..
Taganrog	..	190	..	..	..	..
Ulcaborg	..	45	110	..	..	..
Wasa	..	620	169	..	243	..
Wiborg	..	585	127	1,022	..	395
Windau	..	202	398	..	267	304
Other Ports	532	..	..	..	..	..
Austria.						
Fiume	..	799	..	696	..	..
Pola	..	760	..	..	..	..
Spalatro	..	..	..	360	..	..
Ragusa	..	..	456	..	..	..
Trieste	5,208	5,800	1,262	641	104	925
Venice	646	..	..	..	..	..
Germany.						
Besserup	..	270	..	..	..	..
Brake	150	..	..	..	..	..
Bremen	100	946	2	..	390	..
Bremerhafen	..	..	..	45	..	..
Brunshausen	..	..	..	..	..	150
Carolynenshyl	..	..	..	..	94	..
Elsfleth	..	240	..	..	..	..
Emden	4,217	534	312	182	186	..
Geestemunde	..	..	..	729	..	127
Hamburg	10,378	15,178	25,118	31,895	27,544	27,115
Hanestown	..	..	..	..	..	983
Harburg	1,669	267	4,553	772	186	133
Homburg	..	..	47	..	..	..
Hooksiel	..	..	..	..	76	100

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Germany—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Leer	40	33	216	14	..	..
Lubeck	254	312	669	1,628	797	740
Mariensiel	..	..	..	..	..	287
Neustadt	460	..	397	312	204	319
Papenburg	..	..	130	..	..	..
Rostock	2,822	946	1,808	1,879	28	911
Stade	..	..	352	165	447	357
Varel	10	76	..	..	..	..
Wismar	332	165	228	580	451	..
Other Ports	113	..	..	..	..	..
Prussia.						
Barth	..	..	..	130	..	..
Colberg	414	..	..	..	..	100
Dantzic	3,851	5,907	17,714	9,153	16,334	12,164
Fairwater	..	..	..	..	..	745
Greifswalde	80	86	..	..	..	340
Konigsberg	4,273	1,583	3,567	446	2,615	2,255
Memel	943	594	4,199	718	1,419	1,498
New Fairwater	..	282	..	..	2,313	500
Pillau	300	..	896	1,332	379	..
Rugenwalde	..	97	..	..	..	..
Stettin	1,123	400	6,094	8,481	6,185	14,862
Stralsund	100	204	200	239	672	922
Swinemunde	1,593	..	4,133	3,846	10,236	7,667
Werden	..	..	..	..	..	50
Wolgast	547	664	509	..	..	..
Other Ports	201	..	..	..	..	..
Holland.						
Amsterdam	635	1,211	340	..	226	748
Flushing	..	480	..	130	..	..
Groningen	..	..	..	..	250	..
Harlingen	..	..	..	40	105	135
Kampen	..	..	..	506	..	10
Middleburg	..	..	150	..	..	..
Niewe Diep	..	..	72	..	..	..
Rotterdam	405	..	951	1,104	4,602	4,861
Vleissingen	..	..	..	..	189	..
Other Ports	304	..	..	..	..	..
Belgium.						
Antwerp	2,293	4,173	4,282	1,990	10,183	13,298
Bruges	110	126	201	..	..	..
Brussels	..	139	..	..	..	..
Ghent	380	583	1,486	803	6,351	4,619
Ostend	90	691	..	85	..	39
Spain.						
Alicante	107	2,116	1,141	5,038	3,467	..
Almazaron	..	..	..	88	..	..
Barcelona	280	..	..	..	7,337	13,831
Bilboa	..	2,830	..	51	178	63
Cadiz	..	260	963	779	..	805
Malaga	1,778	5,050	1,631	967	3,494	3,439
Motril	..	..	277	280	..	..
San Sebastian	..	..	331	..	..	..
Santander	..	..	144	..	1,119	150
Seville	300	948	637	1,008	1,045	489
Tarragona	..	..	..	..	..	563
Torre-del-Mar	419	199	174	168	..	151
Vigo	145	..	..	..	..	..
Villa Nueva	..	..	..	..	..	454
Portugal.						
Figueira	..	..	..	..	..	121
Lisbon	670	1,253	1,847	..	2,309	4,365
Oporto	..	734	475	540	..	..
Pemeran	..	..	..	76	..	..
Italy.						
Ancona	953	..	378	463	577	375
Civita Vecchia	..	231	1,276	317	..	..
Genoa	5,402	6,367	1,637	7,859	6,498	4,278
Leghorn	..	..	1,515	..	..	..
Naples	1,339	725	302	5,479	2,687	3,593
Nice	..	335	..	..	..	..
Mediterranean Sea.						
Cagliari	..	..	..	1,460	26	..
Calvi (Corsica)	..	1,548	..	..	..	..
Corfu	4,168	2,595	5,452	935	1,164	130
Gibraltar	973	607	..	120	..	..
Cagliara	..	..	..	..	..	162
Licata (Sicily)	..	..	..	..	300	..
Malta	1,768	1,348	..	452	..	..
Messina	1,360	140	748	1,464	481	2,018
Palermo	165	1,004	..	..	..	..
Zante	..	200	235	..	466	..
Greece.						
Athens	392	..	440	..	328	..
Patras	175	..	..	..	..	..
Syra	1,768	3,892	260	..	..	..

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No. 2.—Coal Exports from Yorkshire—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
TURKEY.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Beyrout	..	488	..	..	..	..
Constantinople	4,828	7,159	3,270	2,082	510	1,535
Galatz	407	..	2,057	..	3,563	974
Kustendji	..	..	..	..	..	704
Ragusa	..	536	390	..	..	..
Salonica	..	..	..	154	..	..
Savyria	..	..	..	..	..	667
Sinope	525	1,161	..	..	..	..
Smyrna	1,287	1,025	1,633	205	650	..
Trebizonde	..	..	625	..	..	..
Varna	..	922	..	..	..	..
Other Ports	200	..	..	..	..	..
AFRICA.						
Alexandria	..	2,942	1,717	78	508	6,641
Algiers	..	..	..	345	..	..
Cape of Good Hope	..	..	..	1,220	..	..
Port Said (Egypt)	..	..	..	248	6,209	14,886
Other Ports	2,054	..	..	..	..	..
AUSTRALIA.						
Melbourne	..	68	..	..	120	..
EAST INDIES.						
Aden	..	..	..	..	..	1,229
Bombay	..	2,000	..	..	2,161	4,279
Ceylon	..	..	..	..	220	..
Hong Kong	..	..	..	1,378	..	..
Kurrachee	..	705	..	..	..	..
Negapatam	..	..	950	..	..	..
Point de Galle	..	..	1,778	..	..	..
Rangoon	..	810	..	..	2,767	..
Shanghae	..	..	700	..	..	..
Singapore	..	..	..	840	..	..
Yokohama	..	..	..	..	..	223
Other Ports	4,977	..	..	..	..	..
WEST INDIES.						
Antigua	..	..	..	..	..	101
Barbadoes	..	764	..	329	629	155
Bermuda	..	648	..	..	..	..
Cardenas	..	..	..	519	..	..
Cienfuegos (Cuba)	..	256	..	..	..	..
Cuba	..	..	660	..	29	311
Havannah (Cuba)	..	1,546	3,192	7,454	2,340	1,158
Hayti	..	..	70	..	..	..
Port-au-Prince	..	..	130	28	..	..
Saint Domingo	..	..	..	..	..	243
Saint Jago-de-Cuba	..	..	48	..	..	..
Saint Thomas	..	..	691	961	..	..
Trinidad-de-Cuba	..	..	..	..	..	270
Other Ports	2,854	..	..	..	..	..
NORTH AMERICA.						
Belize	..	..	..	..	..	50
Boston (U.S.)	..	..	..	798	..	..
Charleston	..	250	..	..	..	..
Galveston	..	..	..	..	..	220
Halifax, N.S.	..	..	202	..	..	..
Harbor Grace	..	..	..	115	..	..
Gaspé Basin	..	..	..	..	..	3
Mobile	..	100	..	..	..	..
Montreal	..	..	304	..	..	178
New Orleans, U.S.	..	101	..	..	..	1,178
New York, U.S.	..	1,817	1,959	..	..	..
Quebec	..	4,163	3,246	5,010	8,756	12,396
Saint Catherine's	..	36	..	..	..	..
Saint John's, N.F.	..	..	..	..	..	388
Saint John's, N.B	..	681	..	..	..	..
San Francisco	..	..	..	..	..	500
Shippegan	..	..	40	..	..	..
Other Ports	2,415	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
SOUTH AMERICA.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Bahia	..	571	311	..	360	..
Berbice	..	..	..	..	222	..
Buenos Ayres	..	730	..	..	..	..
Callao	..	..	256	..	..	997
Ceara	..	..	453	..	..	..
Demerara	..	450	410	..	..	..
Maroim	..	..	200	..	..	..
Monte Video	..	2,273	..	772	350	..
Para	..	..	..	..	..	198
Paramariba	..	..	..	..	425	..
Pernambuco	..	..	..	..	308	836
Rio Grande	..	..	..	..	223	..
Rio Grande de Sul	..	213	..	..	..	..
Rio Janeiro	..	1,342	911	1,301	416	..
Rio Nunes	..	..	..	..	198	..
Vera Cruz	..	190	..	..	..	..
Other Ports	3,915	..	..	..	..	..
CHANNEL ISLANDS.						
Alderney	..	..	..	105	..	..
Guernsey	..	834	..	..	..	648
Jersey	..	965	921	966	..	1,338
Sark	..	..	..	..	1,467	..
Other Ports	1,094	..	..	..	..	..
AZORES.						
Fayal	..	..	190	115	373	..
Saint Michael's	..	..	180	461	..	..
Other Ports	540	..	..	..	..	..
CANARIES.						
Teneriffe	..	..	736	222	..	..
MADEIRA.						
Funchal	..	..	..	458	..	..

General Summary of Coal exported from Yorkshire during the under-mentioned Years.

Name of Country to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France	84,555	77,565	62,665	68,834	81,900	81,561
Denmark	29,196	35,330	38,514	32,787	55,429	65,727
Norway	5,865	8,529	13,259	13,899	17,913	25,661
Sweden	8,763	14,698	15,666	17,401	21,336	33,270
Russia	33,103	23,368	30,858	40,234	45,961	46,182
Austria	5,849	3,600	1,718	641	104	925
Germany	20,508	18,967	33,811	33,501	30,358	31,251
Prussia	13,404	9,117	37,111	24,195	49,123	41,251
Holland	1,334	1,691	1,513	1,320	5,572	5,745
Belgium	2,873	5,681	5,969	2,978	16,563	17,956
Spain	5,059	11,531	5,145	8,369	16,710	19,945
Portugal	670	1,987	2,332	616	2,309	4,496
Italy	8,135	7,748	5,106	14,056	9,762	8,246
Mediterranean Sea	8,369	7,442	6,455	4,431	2,457	2,310
Greece	2,329	3,892	1,420	..	328	..
Turkey	7,247	11,311	7,955	2,441	4,723	3,689
Africa	2,054	2,948	1,717	2,640	6,717	21,527
Australia	..	68	..	..	120	..
East Indies	4,977	3,515	3,428	2,218	5,148	5,731
West Indies	2,854	3,214	4,791	2,291	2,908	2,238
North America	2,415	7,148	5,753	5,918	8,756	15,413
South America	3,915	5,769	2,541	2,073	2,507	2,971
Channel Islands	1,094	1,819	921	1,091	1,467	2,006
Azores	540	..	370	596	373	..
Canaries	..	..	736	222	..	..
Madeira	..	..	..	458	..	..
Total Exports	253,063	260,182	289,724	295,702	379,640	442,531

No. 3.—Exports of Coal from Lancashire to Foreign Ports from 1858 to 1868.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
FRANCE.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Basse Indre	..	..	..	179	..	..
Bayonne	197	180	..	1,269	778	137
Benic	..	70	..	..	..	..
Blaye	27	..	..	..	..	..
Bordeaux	12,848	15,185	10,584	9,071	12,101	10,029
Boulogne	..	276	154	3,653	1,741	..
Brest	..	300	15	..	..	..
Caen	..	..	..	..	340	390
Calais	..	50	..	..	1,109	..
Cette	..	..	..	422	..	25
Charente	200	179	..	37	..	..
Coneron	..	..	1,640	1,253	1,549	..
Conquet	..	..	..	..	160	..
Dieppe	388	..	345	1,120	..	..
Dunkirk	..	1,655	..	2,166	8,129	130
Eu	100	..	..	..	..	..
Granville	..	..	..	..	210	..
Havre	2,114	..	..	398	2,139	5
Indredt	..	..	35	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
FRANCE—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
La Rochelle	..	169	200	..	..	..
Landerneau	..	..	25	..	..	..
Lucon	..	..	..	..	340	..
Marans	..	..	..	..	173	..
Marseilles	1,161	913	539	283	179	..
Morlaix	..	170	..	..	..	..
Morique	..	..	150	217	..	..
Mortagne	..	..	..	86	..	..
Mossele Bay	6,698	..	..	..	..	..
Nantes	..	10,745	3,083	3,756	490	175
Point-aux-Herbes	..	165	..	409	..	..
Rochfort	..	153	25	..	..	..
Rouen	400	404	..	..	166	149
St. Brieux	..	..	..	..	469	..
St. Croix	..	244	..	..	..	..
St. Nazaire	..	..	1,324	..	304	359
St. Vaast	..	..	..	..	70	..
St. Valery-sur-Somme	..	..	404	..	..	..
Toulon	..	823	..	..	..	..

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No. 3.—Coal Exports from Lancashire—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
DENMARK and the DUCHIES.						
Aalborg	..	..	..	333	..	..
Aarhuns	..	..	60	..	..	..
Bornholm	..	..	..	110	..	..
Copenhagen	91	..	..	897	..	..
Faroe	..	..	..	70	..	..
Flensborg	..	..	..	150	..	170
Isefjord	..	..	..	..	..	32
Nakskov	118	..	..	..	..	..
Saxjobing	..	..	..	..	..	304
Thisted	..	..	..	..	116	..
Tonning	..	..	..	67	..	..
Other Ports	94	..	..	..	..	..
NORWAY.						
Christiansand	..	..	..	..	..	154
Christiansund	..	50	..	..	..	..
Droback	..	..	..	..	..	1,109
Jessefjord	..	..	..	40	..	..
Wardoe	..	..	..	50	..	..
SWEDEN.						
Gefle	..	100	..	..	..	..
Norkoping	..	37	..	..	..	..
RUSSIA.						
Cronstadt	2,332	2,277	929	673	1,854	20,147
Helsingfors	..	16	..	..	..	..
Kertch	..	258	..	..	..	..
Narva	..	290	135	184	354	40
Nicoleff	..	..	120	..	..	..
Odessa	691	7,384	4,818	5,043	3,964	..
Revel	235	..	..	..	..	..
Riga	..	..	..	279	..	..
St. Petersburgh	927	930	501	981	780	1,040
Uleaborg	..	45	..	..	..	..
Wiborg	..	..	..	92	..	..
Other Ports	176	..	..	..	..	..
AUSTRIA.						
Pola	..	..	90	..	..	..
Trieste	9,745	5,285	1,641	2,778	9,406	171
Venice	2,276	3,893	..	1,943	..	..
GERMANY.						
Bremen	..	206	..	..	..	..
Hamburg	..	..	..	..	..	245
Neustadt	..	..	..	..	..	318
PRUSSIA.						
Dantzic	..	..	92	191	..	..
Stettin	116	510	321	..	..	..
Swinemunde	..	324	..	..	..	5
HOLLAND						
Flushing	..	..	..	..	146	..
Rotterdam	..	..	..	139	..	..
BELGIUM.						
Antwerp	..	25	131	301	900	110
SPAIN.						
Adra	..	..	109	..	..	..
Alicante	85	182	1,815	335	4,266	..
Barcelona	430	181	3,325	1,794	80	650
Bilboa	..	200	1,315	8,630	400	..
Cadiz	816	1,702	3,148	1,044	1,257	2,906
Carthagena	..	..	45	636	..	..
Corunna	..	..	180	..	..	..
Denia	..	70	55	19	..	..
Huelva	..	174	405	211	140	..
Malaga	634	1,080	581	4,063	3,785	3,362
Motril	..	172	..	169	..	383
Pahamos	..	..	204	..	..	..
Rosas	..	..	100	..	..	..
San Sebastian	..	112	183	278	..	..
Santander	33	553	783	..	7,925	5,624
Seville	802	359	271	1,145	607	1,833
Tarragona	50	..	..	106	1,822	..
Torre-del-Mar	209	534	..	650	..	..
Valencia	144	70	183	496	636	449
Vigo	20	..	..	..	..	..
Other Ports	150	..	..	..	..	..
PORTUGAL.						
Aveiro	..	403	30	..	..	..
Lisbon	4,393	3,795	2,771	6,809	3,990	4,035
Oporto	210	606	2,278	1,531	1,652	3,318
Pomeran	..	..	285	..	1,701	1,634
Portalegre	..	..	20	70	..	..
Saint Ubes	..	..	..	..	400	..
Other Ports	389	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Ton	Tons.	Tons.	Tons.	Tons.	Tons.
ITALY.						
Ancona	130	..	100	..	..	..
Biri	..	..	..	..	1,120	743
Civita Vecchia	4	..	3,650	3,101	602	746
Genoa	9,328	7,134	16,830	22,884	9,460	4,511
Leghorn	900	134	165	920	420	..
Naples	375	1,611	500	2,601	815	1,468
Nice	..	30	22	..	..	..
Pertusola	..	..	1,323	3,145	..	2,017
Salerno	..	..	..	..	271	658
Spezzia	..	..	..	2,087	896	..
Venice	..	..	..	..	579	213
MEDITERRANEAN SEA.						
Abydos	..	..	..	206	..	..
Cagliari	..	..	242	..	..	..
Calvi (Corsica)	..	1,828	..	..	..	..
Corfu	2,545	10,051	1,645	3,232	2,076	..
Gibraltar	14,391	25,045	11,602	19,041	9,489	6,616
Girgenti	..	145	..	..	108	..
Larnica (Cyprus)	..	..	..	127	..	..
Malta	10,212	12,352	27,143	29,023	13,582	5,677
Marsala	..	..	..	40	..	..
Messina	518	142	..	90	1,088	3,256
Palma (Majorca)	156	466	372	532	1,100	2,549
Palermo	850	..	..	282	325	738
Port Mahon	..	..	152	..	..	..
Other Ports	144	..	..	..	..	..
GREECE.						
Athens	667	..	..	243	..	376
Patras	..	107	..	..	..	..
Piræus	..	..	..	..	3,184	310
Spezzia	..	..	..	857	427	380
Syra	2,512	1,611	1,322	473	1,596	80
TURKEY.						
Beyrout	376	540	310	..	..	..
Bussorah	..	..	..	..	196	..
Canea	..	..	..	107	..	..
Constantinople	3,306	4,788	1,326	4,098	2,266	2,603
Galatz	..	1,189	1,233	1,317	877	819
Haivali	..	..	..	..	..	40
Ibrail	..	165	..	..	..	..
Kustendji	..	..	323	2,116	..	1,136
Mersyne	..	..	..	..	..	100
Mytelene	..	..	..	..	114	..
Rhodes	..	498	..	..	..	..
Salonica	..	..	91	174	496	70
Sinope	502	525	..	..	..	..
Smyrna	501	724	405	986	1,830	100
Sulina	..	750	..	..	263	..
AFRICA.						
Alexandria	..	4,844	3,218	13,868	12,815	12,515
Algiers	..	468	..	..	..	..
Algoa Bay	..	153	139	102	160	513
Bathurst (R. Gambia)	..	..	..	..	188	..
Bona	..	802	..	..	..	..
Bonny	..	1,272	..	..	..	219
Cape de Verds	..	..	..	1,337	..	..
Cape of Good Hope	..	2,899	300	1,986	1,127	1,461
Cape Town	..	168	873	..	..	999
Congo	..	..	..	..	59	..
Damietta	..	..	335	..	..	..
Fernando Po	..	..	733	673	..	601
Gaboon	..	84	..	..	..	..
Kensembo	..	..	..	..	100	278
Lagos	..	..	..	35	322	1,033
Mogadore	..	..	..	145	102	..
Mozambique	..	..	..	..	..	200
New Calabar	..	..	..	..	..	98
Old Calabar	..	135	..	..	..	..
Oran	..	..	..	..	..	355
Popo	..	..	..	..	..	40
Port Elizabeth	..	..	..	..	..	50
Port Natal	..	10	6	183	200	..
Port Said (Egypt)	..	..	..	..	..	1,571
Sierra Leone	..	375	..	802	379	505
St. Paul de Loando	..	1,034	..	45	..	..
Other Ports	13,215	..	..	..	..	..
AUSTRALIA.						
Adelaide	..	..	269	477	251	139
Hobart Town	..	..	..	..	..	3,944
King George's Land	..	..	1,576	..	1,836	..
Melbourne	..	1,635	2,546	2,513	357	554
Moreton Bay	..	..	143	..	..	..
Queensland	..	..	661	100	..	..
Swan River	..	..	..	..	..	2,033
Sydney	..	393	..	200	..	..
Victoria	..	..	67	42	..	..
Other Ports	11,067	..	..	..	..	..
EAST INDIES.						
Aden	..	53,039	26,593	24,730	33,479	33,947
Akyab	..	..	504	288	..	..
Amoy	..	..	..	..	..	150
Andaman Isles	..	..	..	..	350	..
Anjer	..	..	1,098	..	..	..
Batavia	..	332	60	158	1,741	1,110
Beypoor	..	..	..	709	181	..

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No. 3.—Coal Exports from Lancashire—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
East Indies—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Bombay	..	36,077	75,017	99,882	206,466	164,630
Calcutta	..	6,497	3,792	12,821	5,429	2,954
Ceylon	..	543	10	355	..	97
Cheribon (Java)	..	..	..	650	..	..
China	..	..	..	..	508	..
Chusan	..	853	..	..	..	..
Cochin	..	..	..	573	688	..
Coconada	..	..	..	1,376	..	300
Colombo	..	15	..	630	..	241
Chufoo	..	..	..	..	646	..
Hangkow	..	..	472	..	..	1,127
Hong Kong	..	3,257	8,777	19,207	10,710	9,135
Karajawa	..	..	..	..	..	50
Kurrachee	..	202	1,617	6,136	5,834	5,145
Madras	..	1,560	1,272	2,437	72	686
Manilla	..	400	..	..	3,066	3,414
Mauritius	..	256	1,065	600	84	..
Moulmein	..	..	752	249	..	..
Muscat	..	..	..	..	..	1,168
Negapatam	..	..	..	..	1,621	..
Onrust	..	..	563	454	1,888	4,575
Penang	..	..	309	783	..	..
Point-de-Galle	..	7,800	17,254	17,753	17,169	14,144
Port Louis (Mauritius)	..	673	..	..	..	..
Rangoon	..	5,994	2,372	9,079	10,676	3,294
Sedashegui	..	..	395	..	..	..
Shanghae	..	1,347	28,068	16,332	3,374	4,641
Singapore	..	2,337	6,990	19,907	6,837	4,664
Sourabaya	..	98	..	4,515	1,129	4,875
Tuticorin	..	..	..	..	573	398
Woosang	..	36,724	..	..	..	..
Yokohama	..	..	..	218	2,490	9,230
Other Ports	63,168	..	..	..	..	..
West Indies.						
Antigua	..	580	432	429	872	261
Barbadoes	..	190	2,075	459	590	669
Bermuda	..	..	2,049	12,138	51	705
Belize	..	..	..	..	..	30
Cardenas	..	851	2,767	3,069	2,640	2,526
Cienfuegos (Cuba)	..	1,315	1,506	2,410	2,270	668
Colon	..	577	190	31	200	443
Cuba	..	..	220	..	1,537	960
Dominica	..	..	..	..	..	5
Gonaives (Hayti)	..	..	100	..	..	..
Guadaloupe	..	..	..	..	60	..
Hamilton	..	..	..	..	490	..
Havannah (Cuba)	..	24,435	23,775	33,710	33,937	22,891
Hayti	..	..	44	104	..	..
Jamaica	..	919	1,421	3,361	477	3,652
Kingston	..	..	1,427	1,951	739	682
Manzanilla	..	..	..	..	481	..
Matanzas (Cuba)	..	654	4,632	4,770	8,629	3,700
Martinique	..	..	5,071	2,628	..	..
Montego Bay	..	30	65	..	..	..
Montserrat	..	..	..	..	..	10
Nassau, N.P.	..	..	5,211	16,417	..	..
Neuritas (Cuba)	..	..	..	..	..	10
Ponce	..	..	..	30	..	..
Port-au-Prince	..	..	..	75	..	821
Porto-Rico	..	922	1,557	1,089	564	5
Port Royal (Jamaica)	..	16	..	..	..	..
Sague-la-Grande	..	35	112	92	..	95
Saint Jago-de-Cuba	..	..	977	886	6	1,161
Saint John's	..	..	..	..	20	..
Saint Kitts	..	..	..	..	..	126
Saint Lucia	..	108	89	9	..	279
Saint Thomas	..	1,883	8,914	6,870	2,518	763
Saint Vincent	..	..	..	1,392	153	104
Santiago-de-Cuba	..	..	..	..	427	6
Sombrero	..	..	..	..	..	50
Tobago	..	..	..	..	..	95
Trinidad	..	330	609	520	859	1,069
Trinidad-de-Cuba	..	584	630	..	1,276	245
Other Ports	23,964	..	..	..	..	..
North America.						
Apalachicola	..	101	..	..	..	..
Baltimore	..	50	1,675	171	..	..
Bangor, U.S.	..	..	346	600	..	..
Bath, U.S.	..	..	..	123	..	..
Bathurst, N.B.	..	..	60	410	..	230
Belize	..	..	..	15	25	120
Boston, U.S.	..	13,337	9,294	2,177	4,965	4,115
Campbell Town	..	..	..	152	..	..
Canada	..	..	204	..	..	..
Carbonear, N.F.	..	93	..	..	..	72
Castine	..	25	..	..	..	..
Catalina Bay	..	..	..	10	..	..
Charleston	..	6,628	..	..	2,427	656
Charlotte Town	..	45	147	..	148	270
Cleveland	..	38	..	..	..	..
Dalhousie, N.B.	..	60	60	50	30	60
Detroit	..	35	..	..	..	..
East Port	..	..	..	..	40	..
Galveston	..	1,197	..	..	905	329
Gaspé	..	54	12	75	..	..
Gloucester, U.S.	..	..	..	45	149	..
Halifax, N.S.	..	499	6,405	1,623	787	206
Hamilton	..	..	..	859	..	..
Harbor Grace	..	522	555	498	727	390
Havre de Grace	..	..	65	..	..	..
Iquique	..	..	..	480	..	..
Key West	..	400	245	..	..	..
Labrador	..	21	20	22	..	20
Laguna-de-Tumin	..	66	..	..	..	..
Matamoras, G. of M.	..	..	..	375	..	1,047
Mobile	..	1,479	..	..	860	..
Montreal	..	597	3,477	968	788	169
Miramichi	..	200	93	40	50	263
Muskwash	..	..	41	..	..	..
Newfoundland	..	591	308	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
North America—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Newhaven	..	..	..	..	1,929	1,156
New London, U.S.	..	378	..	..	..	..
New Orleans, U.S.	..	4,537	12,512	2,506	1,096	113
New York, U.S.	..	117,482	112,452	67,933	27,657	22,620
Pensecola	..	..	..	..	117	..
Philadelphia	..	280	..	..	..	..
Picton, N.S.	..	..	109	..	..	..
Portland, U.S.	..	866	1,199	1,375	..	..
Prince Edward's Island	..	..	..	330	..	..
Providence, U.S.	..	952	..	971	..	..
Quebec	..	13,115	11,996	5,498	8,002	6,283
Richibucto	..	255	16	12	52	30
Sackville, N.B.	..	..	..	15	..	..
Saint Catherine's	..	156	..	..	451	..
Saint John's, N.F.	..	1,582	1,313	1,573	75	1,120
Saint John's, N.B.	..	10,314	14,376	5,960	5,719	6,184
Saint Stephen's	..	..	..	100	..	..
San Francisco	..	3,768	3,782	6,671	6,812	19,410
Savannah	..	4,021	..	..	1,990	1,545
Shippegan	..	..	..	..	..	35
Summerside, P.E.I.	..	..	..	..	100	..
Tampico	..	..	29	..	135	56
Victoria, V.I.	..	..	..	..	..	30
Weymouth, N.S.	..	..	..	..	25	..
Windsor, N.S.	..	..	..	..	..	50
Yarmouth, N.S.	..	10	110	..	..	..
Other Ports	168,441	..	..	..	..	..
South America.						
Acapulco	..	..	..	700	..	..
Arica	..	254	15	495	50	..
Aspin wall	..	239	443	..	461	398
Bahia	..	4,054	4,226	6,337	7,453	7,146
Berbice	..	65	1,063	370	..	269
Brazil	..	628	840	..	..	..
Buenos Ayres	..	7,806	6,692	7,179	12,144	9,606
Caldera	..	100	955	1,600	1,856	1,548
Callao	..	568	2,023	3,329	4,294	13,468
Carrizal	..	..	..	..	77	100
Cayenne	..	187	..	..	..	..
Ceara	..	993	..	1,054	1,449	1,229
Central America	..	..	..	..	192	..
Chanaral	..	..	100	..	..	..
Cobija	..	..	..	..	..	881
Coquimbo	..	..	388	5,345	800	430
Curacoa	..	80	624	1,177	814	2,196
Demarara	..	4,656	7,418	6,448	4,351	7,415
Greytown	..	..	..	..	10	..
Guayacan	..	..	..	..	735	..
Guayaquil	..	223	..	30	..	..
Huanchaco	..	90	..	..	..	..
Iquique	..	..	..	..	1,107	2,669
La Guayra	..	..	239	391	313	200
Lima	..	1,310	667	2,360	2,047	2,169
Macao	..	..	50	..	..	..
Maracaybo	..	..	41	..	..	..
Maranham	..	2,310	1,967	3,516	4,196	2,346
Mayaquos, P. Rico	..	..	..	32	..	..
Monte Video	..	1,917	4,122	6,852	5,115	4,957
Natal	..	..	..	..	100	..
Nickerie	..	270	341	423	308	545
Panama	..	..	640	1,335	1,213	..
Para	..	502	613	696	1,908	2,867
Paraiba	..	210	..	..	..	..
Paramariba	..	50	63	..	670	2,321
Pernambuco	..	4,074	7,907	6,570	5,485	10,572
Porto Alegre	..	..	..	..	20	..
Porto Bello	..	..	40	204	..	..
Porto Plata	..	..	..	20	..	..
Puchoco	..	..	..	..	295	..
Puerto Cabello	..	..	..	1,796	..	..
Rio de la Plata	..	..	..	244	..	..
Rio Grande	..	252	213	46	229	537
Rio Grande de Norte	..	50	..	40	..	..
Rio Grande de Sul	..	700	99	314	225	31
Rio Janeiro	..	26,410	13,897	27,970	21,576	13,208
Rosario	..	..	..	467	652	716
San Jose	..	..	..	..	100	..
Santa Catherine	..	..	..	..	828	..
Santa Catalina	..	..	..	..	7	..
Santa Cruz	..	..	610	..	..	..
Santos	..	159	260	20	633	857
Savanilla	..	..	5	..	..	..
Surinam	..	387	60	390	318	532
Tocofilla	..	..	..	207	921	..
Tucacas	..	..	..	102	..	..
Valparaiso	..	7,477	13,372	23,906	9,160	13,164
Vera Cruz	..	633	2,806	1,132	534	105
Victoria, V.I.	..	..	510	134	..	..
Other Ports	82,071	..	..	..	..	..
Channel Islands.						
Guernsey	..	48	9	65	..	..
Jersey	..	141	56	111	1,397	395
Other Ports	505	..	..	..	..	..
Iceland.						
Bernfjord	112	74	142	127	235	3
Azores.						
Fayal	..	..	1,202	256	270	..
Saint Michael's	..	240	253	141	175	30
Terceira	..	54	..	353	..	..
Other Ports	476	..	..	..	..	..

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No. 3.—Coal Exports from Lancashire—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
CANARIES.						
Teneriffe	..	200	..	49	..	16
MADEIRA.						
Funchal	305	..	299	544	..	954
SAINT HELENA	300	..	460	..	..	..
FALKLAND ISLANDS.						
Stanley	..	..	60	120	..	..
NEW ZEALAND.						
Auckland	..	..	..	..	..	10
Otago	..	..	..	140	..	149
Port Chalmers	..	..	..	..	..	161
Nelson	..	..	..	..	..	235
SANDWICH ISLANDS.						
Honolulu	267	90	350	417	120	81

General Summary of Coal exported from Lancashire during the under-mentioned years.

Name of Country to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France	24,406	31,593	18,453	24,218	30,310	11,381
Denmark	303	..	60	1,627	116	506
Norway	..	50	..	90	..	1,263
Sweden	..	137	..	..	..	..
Russia	4,861	11,200	6,503	7,252	6,942	21,227
Austria	12,021	9,178	1,731	4,721	9,406	171
Germany	..	206	..	..	..	563
Prussia	116	854	413	191	..	15
Holland	..	..	..	139	146	..
Belgium	..	25	131	301	900	110
Spain	3,375	5,369	12,702	19,598	20,918	15,207
Portugal	4,992	4,806	5,384	8,410	7,743	8,987
Italy	10,737	8,909	22,590	34,738	14,163	10,377
Mediterranean	35,816	50,029	41,156	52,573	27,768	18,816
Greece	3,179	1,718	1,322	1,573	5,197	1,146
Turkey	4,685	9,179	3,687	8,798	6,071	4,868
Africa	13,215	12,238	5,604	19,561	15,444	20,626
Australia	11,087	2,028	5,062	3,132	2,444	6,659
East Indies	63,168	158,054	176,986	240,442	317,061	275,005
West Indies	33,964	33,324	63,873	92,440	53,791	43,036
North America	168,441	183,743	180,892	101,449	65,398	73,193
South America	82,071	66,656	73,980	118,744	92,689	106,676
Channel Islands	505	189	65	176	1,397	385
Iceland	112	74	142	127	235	3
Azores	476	294	1,545	709	445	30
Canaries	..	200	..	49	..	16
Madeira	305	..	299	544	..	954
St. Helena	300	..	460	..	..	..
New Zealand	..	..	..	140	..	555
Falkland Islands	..	..	60	120	..	..
Sandwich Islands	267	90	350	417	120	81
Total Exports	467,802	590,128	623,450	742,279	678,704	621,856

No. 4.—Export of Coal from the Western Ports to Foreign Countries from 1858 to 1868.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE.						
Abbeville	118	..	..	..	106	438
Agon	..	..	..	435	..	..
Antebes	..	..	..	..	..	220
Angus	..	..	1,619	..	..	..
Arcachou	..	..	..	..	850	1,127
Ars	..	..	..	..	338	615
Audierne	50	110	60.	113	..	228
Auray	..	150	145.	315	600	2,190
Azier	..	..	58.	..	..	..
Barfleur	..	110	220	110	90	107
Basse Indre	278	3,789	4,921	1,427	3,268	5,089
Bayonne	1,638	2,351	4,408	10,944	5,699	2,916
Beauvoir	104	82	275	308	488	113
Belle Isle	..	115	72	..	146	305
Benic	..	65	..	125	98	260
Bidac	..	..	70	..	..	..
Blaye	..	..	..	339	..	..
Bordeaux	43,974	43,048	104,700	52,561	81,755	87,144
Boulogne	260	1,136	..	..	2,326	982
Bourganeuf	70	..	..	150	..	..
Brehat	..	..	..	..	..	140
Brest	3,326	3,596	3,396	4,413	12,669	12,490
Caen	7,362	14,656	22,229	30,946	46,209	39,495
Calais	1,487	..	..	..	..	..
Cannes	..	..	..	..	180	180
Carentan	1,329	1,139	5,579	1,348	1,105	1,358
Cauterets	40	..	..	..	..	..
Cayenne	..	..	..	..	818	1,583
Cette	671	196	207	..	..	..
Chantenay	..	..	..	..	240	194
Charente	2,198	6,580	9,167	12,560	18,969	19,908
Chateau	..	..	225	..	80	667
Chateaulin	..	..	..	121	533	..
Cherbourg	1,960	4,068	4,826	5,927	19,075	17,658
Collet	..	..	..	..	..	117
Concarneau	..	162	290	231	60	67
Coneron	..	..	465	582	335	2,008
Conquet	..	..	..	943	45	105
Courcon	..	..	..	..	78	..
Courseulles	..	..	..	..	..	100
Croisset	260	..	..	..	..	..
Croisic	..	376	492	1,165	963	736
Dahowet	155	46	432	495	203	252
Daoulas	..	..	..	..	..	110
Dieppe	32,180	35,404	48,613	40,548	96,031	86,335
Dinan	130	..	265	..	..	..
Douarnenez	..	..	65	..	65	..
Duclair	..	..	..	..	1,726	..
Duclaic	..	..	..	..	590	..
Dunkirk	353	6,389	25	240	290	200
Dulette	..	..	..	..	100	485
Erquy	..	..	68	..	23	..
Etaples	..	..	..	..	95	..
Eu	..	150	..	..	345	448
Fecamp	275	1,979	3,181	3,414	13,443	14,975
Granville	3,725	4,156	4,607.	3,624	3,311	3,787
Gravelines	..	..	..	..	351	454
Guijaves	..	..	..	..	..	158
Harfleur	..	..	..	..	300	15,130
Havre	40,179	63,632	29,927	45,116	114,262	102,533
Hennebont	..	849	1,052	4,240	6,929	2,923
Honfleur	5,462	6,689	13,819	23,096	25,443	2,195

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE—*cont.*						
Indredt	..	..	80	..	120	..
Isle Dieu	..	158	..	..	..	46
Isle D'Oleron	..	..	..	70	..	120
Isle D'Yeu	..	..	..	..	..	105
Isle-de-Rhe	80	262	262	308	332	..
Isigny	690	110	1,490	1,659	5,446	4,532
La Bonville	..	400	265	..	..	..
La Bouille	752	375	..	360	320	709
La Brault	..	..	..	650	170	160
La Breau	..	..	140	..	..	..
La Faon	..	..	..	..	120	..
La Flotte	..	95	175	75	140	78
La Legue	..	..	..	..	140	..
L'Orient	660	1,147	1,701	1,520	1,049	1,902
La Rochelle	9,015	11,145	14,773	15,780	33,221	33,010
La Tremblade	156	270	130	..	533	1,302
Le Sables	96	..	..	..	..	..
Le Vivier	169	97	72	..	..	..
Les Monnards	..	..	..	..	295	461
Landernau	967	1,311	2,044	3,381	..	2,973
Lannion	657	929	1,154	1,115	1,094	743
Ligure	..	..	672	..	..	..
Loix	88	..	..	..	..	..
Lucon	439	1,072	1,372	1,179	1,226	1,765
Marans	260	969	2,550	704	1,158	465
Marennes	..	..	229	..	260	865
Manbert	..	..	..	70	116	..
Marseilles	52,015	13,733	15,576	18,901	14,784	37,672
Morlaix	1,183	1,818	2,795	2,475	2,848	2,477
Morique	100	331	344	..	218	495
Mortagne	..	..	78	138	176	433
Nantes	76,744	73,211	99,356	84,326	76,697	63,184
Nice	..	..	..	546	..	..
Paimbœuf	180	..	437	552	860	840
Paimpol	583	332	229	292	662	665
Palas	..	..	40	..	..	..
Paluden	..	..	..	..	244	218
Perrs	68	85	285	165	60	60
Plancoet	..	..	..	205	80	424
Plougaznon	..	..	..	..	..	75
Plonescat	..	..	..	..	..	75
Point-aux-Herbes	..	413	1,692	1,523	3,572	3,633
Point-au-de-Mer	..	..	555	245	2,037	1,815
Pontasval	..	..	..	..	110	128
Pontorson	..	..	..	128	399	470
Pontrieux	482	512	1,114	956	849	832
Pont L'Abbe	276	649	517	897	402	129
Pornic	135	..	176	480	305	850
Port-au-Bessin	245	260	2,305	2,497	3,856	3,429
Port Bail	..	80	62	68	..	120
Port Deisalle	..	580	..	..	..	..
Port Launnay	..	..	78	732	1,448	516
Port Louis	..	..	..	48	500	..
Port Vendre	..	..	..	..	..	117
Pouliguen	290	377	1,289	909	860	905
Quiberon Bay	52	721	441	260	352	271
Quillebœuf	..	..	..	120	148	88
Quimper	382	304	753	1,248	948	1,409
Quimpule	..	..	..	430	..	..
Redon	4,528	1,845	1,458	190	670	519
Regneville	6,390	6,562	7,951	7,558	10,136	8,892
Reberon	..	..	..	..	348	412
Roche Barnard	..	120	299	135	..	80
Rochelle	..	..	..	3,179	..	..

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No. 4.—Export of Coal from the Western Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
FRANCE—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Rochfort	4,015	3,524	7,515	6,664	5,573	6,651
Roscof	134	385	204	63	90	181
Rouen	19,056	10,094	10,157	6,090	26,352	31,186
Royan	..	..	..	270	282	614
Sables	..	94	327	260	..	1,363
Sables d'Olonne	115	453	593	1,043	2,617	1,424
St. Andre-de-Cubrac	..	..	175	..	..	..
St. Brieux	1,694	1,999	1,778	3,139	2,544	2,484
St. Croix	..	..	238	..	..	..
St. Germains	196	..	..	255	156	75
St. Germains-sur-Aye	..	290	..	..	..	..
St. Gilles	432	..	..	139	381	566
St. Louis	..	247	..	1,077	..	..
St. Malo	12,039	7,974	18,337	25,212	36,948	43,360
St. Nazaire	5,684	12,735	27,991	51,093	133,366	144,499
St. Servan	87	66	782	753	672	602
St. Vaast	230	165	342	400	205	1,180
St. Valery	..	..	..	..	2,174	1,919
St. Valery-en-Caux	1,743	..	90	310	..	..
St. Valery-sur-Somme	193	..	..	..	..	248
Salon	..	646	..	..	..	..
Setques	..	..	..	..	..	280
Toulon	..	153	637	365	2,019	263
Treguier	215	737	962	227	1,302	734
Treport	115	327	166	951	623	1,255
Trouville	..	..	447	329	8,314	17,605
Vannes	206	245	536	503	743	418
Ville D'Eu	..	..	120	70	..	..
Viviers	..	..	..	86	..	..
DENMARK and the DUCHIES.						
Aalborg	1,201	372	..	..	1,059	1,097
Aaroeskoping	..	..	..	..	136	..
Aaroeskjobing	..	..	248	..	..	..
Aarhuus	948	593	583	..	..	726
Altona	..	..	..	568	25	..
Apenrade	..	110	369	..	..	..
Arnies	..	..	..	34	..	..
Assens	..	..	270	..	..	..
Bandholm	..	..	225	..	..	160
Bogense	..	286	..	..	100	294
Camellas	..	145	..	..	..	..
Cappeln	..	..	222	..	..	..
Copenhagen	5,325	7,512	13,746	20,320	17,746	17,604
Dangaard	..	..	215	..	..	..
Donarcux	..	..	..	69	..	..
Ebeltoft	..	61	..	..	..	..
Eeroeskjobing	..	..	80	301	97	86
Elsinore	1,186	746	1,024	1,411	1,356	650
Exorombrera	..	..	..	..	186	..
Faaborg	184	627	836	606	934	358
Fanoe	..	517	184	635	92	180
Faroe	..	..	284	..	..	..
Faxo	..	..	..	..	360	150
Fehmern	..	..	130	240	128	..
Flensborg	782	552	3,227	2,937	6,136	6,598
Fredericia	1,195	1,229	2,085	1,497	1,168	1,374
Frederikshaven	317	..	240	320	645	1,454
Fredericksund	..	130	..	..	..	..
Fredericksroork	..	..	..	..	..	180
Garruchs	..	..	1,118	1,745	..	..
Gottorp	..	86	..	..	..	..
Grennaae	..	..	145	147	..	..
Hadersleben	92	..	..	..	70	316
Hadersley	..	..	..	..	309	..
Helingenhafen	..	237	272	226	..	782
Hielsminde	..	..	..	..	495	487
Hjarbeck	..	..	52	..	..	..
Hobroe	..	..	..	..	116	318
Holbeck	..	65	..	..	235	250
Hondeklife	..	..	..	180	1,574	200
Horsens	313	222	198	375	134	..
Howacht	..	..	84	..	..	154
Hoyer	..	..	..	..	50	132
Kallundborg	..	..	162	200	662	1,148
Karrebecksminde	464	590	195	457	..	156
Kastrup	..	..	..	..	415	..
Kiel	..	..	1,579	1,481	558	1,326
Kjertiminde	..	106	..	..	..	..
Kjoge	..	439	106	..	..	..
Kolding	..	117	410	290	90	..
Korsoer	1,539	2,141	2,640	2,316	3,453	1,997
Lokken	..	106	..	..	..	..
Marstall	..	..	90	173	..	..
Middlefahrt	..	131	299	308	..	..
Mullerup	..	460	572	145	650	..
Nakskov	60	350	..	..	..	..
Nestord	..	..	129	..	..	..
Nihe	..	..	..	..	..	85
Nivaa Baya	..	..	556	..	..	210
Nordborg	..	..	..	..	112	..
Novaargaard	..	143	..	..	..	..
Nyborg	339	406	150	796	398	659
Nyekjobing	699	75	538	62	..	90
Nysted	..	..	90	186	..	..
Odense	723	173	245	308	160	..
Randers	117	170	584	85	222	457
Rendsborg	..	..	..	..	..	524
Roeskilde	383	543	306	..	127	215
Rorvig	..	224	200	170	..	..
Rudkjobing	108	96	508	188	..	80
Saxjobing	..	..	180	190	308	310
Schlesvig	..	..	..	..	..	74
Skjelsker	588	322	..	279	618	220
Sonderborg	..	300	849	807	1,266	940
Stege	..	..	..	..	111	105
Svendborg	134	446	1,978	1,499	..	2,980
Thisted	..	624	..	..	..	..
Tonning	199	..	..	..	..	..
Tonningen	..	220	..	..	..	..
Wedbeek	..	161	..	..	..	..
Weile	184	144	371	100	..	848
Wordingborg	..	..	..	..	212	..
Other Port	2,337	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
NORWAY.						
Aalesund	698	..	..	..	76	..
Aasgaardstram	..	60	..	..	..	..
Altongaard	..	169	..	..	..	..
Arendhal	..	515	..	..	..	133
Bergen	330	5,160	..	100	1,720	2,325
Bodoe	..	3,992	..	..	..	..
Brevig	..	442	..	..	..	130
Christiania	..	25,551	..	..	430	263
Christiansand	..	3,562	..	170	781	409
Christiansund	90	844	..	..	594	1,289
Dram	..	1,233	..	..	..	..
Drammen	..	2,031	..	..	169	623
Drontheim	684	1,877	350	350	425	600
Egersund	..	71	115	..	410	..
Flekkifiord	..	470	..	..	..	..
Frederickshald	..	3,162	..	..	..	..
Fredericksvoern	..	516	..	120	..	..
Frydenhand	..	..	..	58	..	..
Hammerfest	..	3,339	..	..	..	..
Holmstadt	..	353	..	..	..	..
Holmstrand	..	585	..	..	..	..
Hovig	..	240	..	..	..	685
Horten	..	190	..	..	..	..
Langesund	..	107	..	..	..	..
Laurvig	100	812	..	..	..	240
Mandhal	..	63	..	62	..	504
Molde	..	313	..	80	..	..
Moss	..	470	..	..	..	..
Oster Risoer	..	131	..	..	..	..
Sandifjord	..	264	..	..	180	..
Skien	..	213	..	..	..	160
Stavanger	..	137	87	..	..	275
Tonsberg	..	1,383	..	..	..	..
Tromsoe	..	2,359	..	..	..	..
Wadsoe	..	393	..	..	..	..
Wardoe	..	376	..	..	..	..
Other Ports	210	..	..	..	..	..
SWEDEN.						
Ahus	..	..	..	130	..	..
Gottenborg	..	1,031	185	1,191	549	442
Gustafsborg	..	544	..	..	..	..
Helsingborg	..	128	..	..	..	180
Landscrona	..	214	..	800	631	1,194
Malmo	98	1,082	492	1,150	120	848
Norkoping	360	..	..	..	..	..
Nykoping	..	..	..	119	..	..
Stockholm	2,446	5,289	2,046	1,105	..	929
Stora	..	..	22	470	710	494
Other Ports	961	..	..	..	..	..
RUSSIA.						
Abo	..	..	..	..	270	145
Archangel	..	..	..	..	200	468
Batoum	..	1,392	..	1,960	2,536	..
Bolderaa	..	..	..	..	..	560
Crimea	..	1,343	..	..	..	..
Cronstadt	19,313	18,847	23,342	16,449	16,444	10,135
Dahlsbruk	..	..	..	..	..	100
Helsingfors	..	..	..	15	884	..
Kertch	..	3,435	..	4,115	1,153	..
Libaw	..	..	..	..	..	449
Narva	136	..	..	..	..	381
Odessa	7,219	19,965	12,364	23,818	31,600	15,931
Pornau	..	120	..	..	..	..
Poti	..	..	..	117	..	..
Revel	143	..	..	..	..	..
Riga	3,636	722	2,307	2,650	1,666	7,309
Rikjavick	..	..	..	..	..	467
St. Petersburgh	2,891	298	297	1,248	1,333	6,845
Sebastopol	..	3,241	..	3,331	..	..
Uleaborg	..	..	..	..	..	300
Wiborg	..	..	..	..	..	83
Other Ports	772	..	..	..	..	..
AUSTRIA.						
Fiume	390	660	..	..	..	..
Gravosa	..	964	..	..	..	..
Pirano	..	280	570	..	..	..
Pola	400	5,171	..	6,345	..	..
Ragusa	..	..	808	1,689	904	734
Trieste	13,441	17,718	14,795	23,820	22,204	41,170
Venice	24,193	18,015	12,581	10,572	3,502	..
Other Ports	481	..	..	..	..	..
GERMANY.						
Bosserup	..	..	..	..	106	..
Brake	230	266	127	..	..	..
Bremen	3,717	2,095	..	..	..	..
Bumerhafen	6,728	711	..	..	..	..
Emden	548	..	..	..	..	..
Hamburg	19,409	14,714	22,037	12,015	29,046	30,598
Harburg	1,504	202	477	..	..	..
Lubeck	4,503	4,880	3,304	3,023	2,777	2,713
Neustadt	738	136	..	802	1,159	332
Papenburg	..	..	147	..	..	..
Rostock	..	..	..	..	760	..
Rostock	110	..	988	378	..	6,395
Travemunde	..	..	..	700	..	..
Wismar	..	..	..	150	490	1,250
Other Ports	486	..	..	..	..	..

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No. 4.—Export of Coal from the Western Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
PRUSSIA.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Burg	..	..	190	..	..	
Dantzic	1,480	2,189	1,282	4,193	5,417	3,007
Konigsberg	592	1,171	238	415	1,706	286
Lissa	..	1,019	..	..	..	..
Memel	560	..	780	1,222	..	350
New Fairwater	..	..	..	..	510	..
Pillau	328	..	..	300	..	2,060
Stettin	1,158	3,755	2,005	719	2,254	2,201
Stralsund	518	443	..	833	1,542	1,014
Swinemunde	2,564	4,033	2,393	4,177	3,005	4,056
Wolgast	..	..	..	220	..	280
HOLLAND.						
Amsterdam	123	..	..	..	12	552
Dordt	200	637	953	790	1,297	404
Groningen	..	125	..	..	..	..
Hellevoetsluys	..	..	..	160	..	..
Middleburg	123	386	280	..	170	480
Niewe Diep	..	..	..	..	..	163
Rotterdam	1,945	2,082	200	725	968	458
Schiedam	..	..	10	..	..	..
Zierickzee	..	..	..	.	..	200
BELGIUM.						
Antwerp	320	160	..	..	770	..
Bruges	1,389	2,597	..	734	997	300
Ghent	..	..	..	45	..	..
Ostend	309	150	..	219	655	85
Phillipville	..	..	..	..	330	607
SPAIN.						
Adra	..	1,870	507	190	..	..
Aloudia	..	..	..	..	1,129	1,152
Alfagus	..	..	140	155	..	..
Algesiras	..	1,120	793	..	..	148
Alicaute	4,738	44,649	27,909	39,895	16,068	7,427
Almeira	..	1,475	..	..	482	..
Barcelona	60,994	73,975	61,800	63,352	70,997	93,091
Bilboa	792	4,191	4,659	13,996	7,236	8,604
Cadiz	18,624	23,332	57,740	54,260	43,097	48,801
Carril	..	..	814	624	..	..
Carthagena	3,352	4,083	4,942	5,742	8,981	12,774
Corunna	1,388	2,721	2,543	3,500	1,351	1,337
Denia	..	619	544	614	662	467
Ferrol	2,759	2,880	818	2,442	494	2,658
Fuentarabia	..	..	..	288	..	..
Huelva	..	..	290	..	410	1,183
Iviza	..	..	619	..	..	..
Malaga	7,281	7,450	5,573	6,483	9,492	10,451
Mataro	2,226	966	2,704	2,632	3,097	3,164
Motril	..	140	..	..	..	..
Palamos	..	324	594	467	460	..
Passages	..	..	..	80	602	854
Port Sul	..	..	557	795	160	70
Roquetas	..	250	..	..	..	..
Rosas	..	284	215	..	..	221
San Carlos de Rapiter	..	..	145	..	185	417
San Felix Quixoles	..	..	144	..	..	..
San Sebastian	..	2,961	8,740	9,506	452	497
Santander	1,633	4,164	6,935	3,495	2,231	1,013
Seville	2,338	7,002	10,226	7,370	18,500	15,944
Sitjes	..	..	..	201	..	..
Tarragona	5,932	6,418	8,233	10,059	10,663	8,945
Coronil	..	..	..	..	..	1,226
Valencia	2,036	972	729	4,428	2,952	449
Vigo	3,479	1,642	4,319	4,762	5,965	..
Villa Nueva	5,382	4,363	3,165	3,707	5,377	..
Villa-Nueva-Geltra	..	454	..	..	..	..
Villaricos	..	1,069	..	..	..	..
Zumaya	..	..	..	351	..	..
Other Ports	2,079	..	..	..	..	..
PORTUGAL.						
Aveiro	..	78	1,084	977	814	708
Lisbon	12,303	27,993	27,100	27,969	43,823	47,671
Oporto	502	637	488	2,690	..	456
Pomeran	..	..	345	1,478	590	500
Saint Ubes	..	..	..	..	640	296
Viana	..	16	..	..	..	..
Other Ports	426	..	..	..	..	..
ITALY.						
Ancona	2,236	2,816	19,279	19,434	22,932	13,145
Biri	..	..	..	1,913	5,805	6,370
Brindisi	..	..	572	3,269	11,622	17,752
Castellamare	..	..	467	1,210	..	..
Civita Vecchia	4,705	3,430	5,072	8,050	1,757	1,252
Gaeta	..	..	..	553	..	..
Genoa	3,209	51,096	92,586	119,083	69,925	77,252
Camogli	..	..	..	..	..	399
Leghorn	327	3,096	5,030	4,822	9,112	20,053
Manfredonia	..	..	..	2,107	..	..
Morfetta	..	..	..	..	275	456
Naples	2,909	7,161	17,514	33,432	27,615	31,909
Nice	..	..	985	..	3,577	1,763
Nisita	..	..	..	292	..	..
Pertusola	..	..	404	..	1,523	212
Pescara	..	..	..	..	..	222
Port Maurice	..	..	..	180	1,014	944
Salerno	..	..	..	..	340	140
Savonia	..	..	..	..	502	..
Spezzia	..	..	..	2,796	..	..
Taranto	..	..	738	..	..	375
Tercino	..	1,669	..	..	..	..
Venice	..	..	330	..	3,121	2,900

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
MEDITERRANEAN SEA.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ajaccio	..	616	880	270	692	540
Bastia	220	1,153	935	..	591	178
Cagliari	769	2,170	5,187	10,669	2,590	6,059
Calos (Corsica)	..	1,184	..	..	..	..
Candia	..	..	..	..	640	..
Catania	1,477	2,012	1,171	2776	2,154	2,022
Corfu	7,322	5,121	13,939	25,171	15,524	15,693
Corsica	..	..	..	..	170	..
Fano	..	65	..	..	..	78
Gibraltar	28,379	43,141	43,727	64,347	75,871	78,146
Girgenti	210	..	238	1,107	..	..
Ivica	..	940	..	..		
Licata (Sicily)	..	477	..	565	254	..
Maddalena	..	..	..	390	..	..
Malta	80,695	98,597	81,741	108,138	110,910	81,070
Marsala	..	540	260	1,522	..	..
Messina	13,603	8,500	7,786	13,524	6,270	14,431
Milazzo	..	..	..	..	..	321
Palma (Majorca)	4,576	3,498	4,467	6,645	6,821	3,683
Palermo	5,985	6,808	7,671	14,388	17,068	13,835
Porto Ferrafo	..	..	..	350	..	..
Port Mahon	828	1,636	2,947	1,179	3,330	3,604
Rousa	..	215	..	..	..	..
Sicily	..	800	168	..	..	..
Syracuse	..	..	..	459	240	2,762
Terranova	..	..	..	60	..	..
Topacalma	..	..	..	156	..	..
Trapani (Sicily)	..	..	..	1,508	..	..
Tumini	..	..	..	..	..	300
Zante	..	790	1,686	1,687	..	2,864
Other Ports	625	..	..	..	..	..
GREECE.						
Athens	2,265	7,468	4,868	682	1,606	2,751
Carlo Forte	..	..	..	180	1,116	1,877
Chalcris	..	675	..	..	..	..
Patras	462	500	1,070	..	3,005	..
Piræus	..	..	..	..	840	1,264
Spezzia	..	..	6,527	2,251	626	1,000
Syra	6,047	7,715	8,640	10,636	14,870	17,283
TURKEY.						
Alexandretta	..	3,113	2,118	1,557	3,146	1,937
Beyrout	4,234	8,674	2,567	4,045	6,419	5,651
Bussorah	..	..	..	..	578	506
Constantinople	44,882	55,022	39,865	60,048	84,965	72,559
Dardanelles	..	..	..	..	534	2,620
Galatz	1,631	1,404	5,417	6,894	3,365	18,746
Gallipoli	..	..	510	..	606	..
Ibrail	..	..	..	..	950	265
Kaya (Palestine)	..	204	..	..	..	..
Kustendji	..	552	1,442	..	447	622
Ragusa	1,128	336	2,537	3,007	2,537	2,181
Rhodes	520	732	..	508	905	..
Salonica	1,500	1,883	1,337	4,460	1,746	1,571
Savonia	..	..	..	..	625	499
Sinope	1,688	1,256	..	1,345	608	1,151
Socca	..	..	..	130	..	..
Smyrna	16,535	16,104	18,066	23,327	26,209	17,645
Suda	..	..	..	..	814	803
Sulina	..	480	6,240	..	268	3,196
Toulscha	..	..	290	..	..	..
Trebizonde	2,162	2,540	1,216	1,596	2,696	2,789
Varna	..	..	..	410	..	..
Other Ports	953	..	..	..	..	..
AFRICA.						
Alexandria	..	40,798	58,374	71,288	71,667	68,488
Algiers	..	7,738	8,067	6,102	14,077	12,989
Algoa Bay	..	..	..	430	573	819
Banana Islands	..	..	..	..	2,149	1,617
Bathurst (R. Gambia)	..	..	304	..	453	..
Bona	..	..	459	..	1,385	2,989
Cape de Verds	..	12,631	25,071	29,120	62,691	31,607
Cape of Good Hope	..	12,726	16,266	27,417	45,960	20,450
Cape Town	..	1,400	..	..	..	480
Dacar	..	..	..	..	7,743	6,143
Chefarnias	..	..	..	..	..	590
Fernando Po	..	4,424	2,127	5,129	1,655	1,002
Jellia Coffee	..	..	..	..	2,239	883
Lagos	..	..	229	1	537	226
Mas-El-Kebin	..	..	..	..	..	300
Mayotta	..	621	..	..	..	..
Mogadore	..	..	..	614	157	..
Mozambique	..	620	1,139	490	300	..
Nossi Be Madagascar	..	..	..	..	121	..
Oran	..	3,257	2,523	1,936	5,128	5,044
Phillipville	..	..	..	..	215	452
Port Elizabeth	..	..	..	350	..	..
Port Grande	..	..	..	2,129	..	..
Port Natal	..	..	74	50	..	..
Port Said (Egypt)	..	..	1,294	1,705	32,371	73,658
Saffi	..	..	..	..	..	146
Sierra Leone	..	1,587	863	4,077	2,373	385
Simon's Bay	..	..	399	1,334	6,288	..
Storah	..	260	444	913	..	..
St. Paul de Loando	..	4,247	3,002	3,545	359	1,420
Suez	..	..	..	1,200	..	..
Table Bay	..	1,792	1,696	3,149	..	1,963
Tetuan	..	850	..	..	..	..
Tunis	..	4,065	1,852	2,765	3,528	1,933
Zanzibar	..	..	..	1,579	1,331	..
Other Ports	73,920	..	..	..	..	..

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No. 4.—Export of Coal from the Western Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
AUSTRALIA.						
King George's Land	..	4,627	2,426	..	1,436	..
Melbourne	..	840	1,250	1,155	..	..
King George's Sound	..	..	..	..	..	4,138
Port Torres	..	871	633	1,613	220	1,270
Sydney	..	3,704	1,780	..	..	..
Other Ports	6,241	..	..	..	..	1,095
EAST INDIES.						
Aden	..	6,179	6,266	3,001	35,730	24,682
Aman River	..	..	..	740	..	..
Amoy	..	..	461	..	..	..
Anger	..	..	734	..	..	2,891
Arachat	..	..	..	85	..	..
Bangkok	..	..	..	915	..	..
Bassein	..	..	..	..	..	747
Bassilan	..	..	6,550	..	..	..
Batavia	..	..	600	540	2,579	812
Bombay	..	8,992	3,655	2,374	24,666	19,462
Calcutta	..	9,466	5,928	7,158	16,757	2,527
Ceylon	..	550	660	..	..	690
Chufoo	..	..	..	..	3,145	1,111
Cochin	..	..	500	..	630	..
Coconada	..	..	..	..	2,624	1,468
Colombo	..	..	..	..	1,046	1,849
Hong Kong	..	50,871	33,264	19,534	27,101	42,880
Japan	..	..	..	..	620	..
Kurrachee	..	980	2,590	..	..	847
Madras	..	5,547	1,520	1,090	1,638	405
Manilla	..	4,584	16,152	3,436	..	5,666
Mauritius	..	4,832	8,065	12,294	26,977	15,211
Moulmein	..	..	..	848	..	..
Muscat	..	..	..	..	5,421	..
Nagasaki	..	..	..	473	..	650
Negapatam	..	783	..	750	540	..
Onrust	..	..	..	..	2,362	4,923
Panay	..	..	600	..	..	..
Penang	..	539	..	..	..	1,097
Philippine Islands	..	..	..	1,560	..	..
Point-de-Galle	..	12,416	12,633	1,823	28,845	17,780
Pondicherry	..	533	..	..	655	..
Port Louis (Mauritius)	..	680	..	..	..	..
Rangoon	..	2,628	..	..	9,632	1,433
Saigon	..	..	..	..	1,100	505
Seychelle Island	..	..	..	..	948	2,093
Munsoorcottah	..	..	..	..	..	842
Shanghae	..	13,841	36,135	26,375	41,468	25,476
Singapore	..	47,171	20,709	21,558	43,270	35,264
Sourabaya	..	..	500	..	3,329	5,501
Trincomalee	..	1,020	..	..	3,346	8,494
Woosang	..	9,157	..	..	..	..
Yokohama	..	..	..	..	5,993	13,624
Zelu (Philippine Islands)	..	..	1,081	..	..	..
Other Ports	85,323	..	..	..	..	..
WEST INDIES.						
Antigua	..	..	677	220	..	..
Barbadoes	..	1,557	1,223	3,549	3,497	3,755
Bermuda	..	4,633	18,607	47,629	7,331	3,545
Cardenas	..	1,512	1,210	1,656	367	5,586
Cienfuegos (Cuba)	..	5,028	845	1,512	1,386	400
Colon	..	204	3,098	..	4,589	11,483
Cuba	..	13,875	11,294	15,571	6,349	12,049
Dominica	..	..	638	..	..	..
Grenada	..	2,569	3,175	3,875	3,028	5,647
Guadaloupe	..	..	884	380	..	2,385
Havannah (Cuba)	..	26,150	89,570	57,422	83,175	53,800
Hayti	..	..	590	..	..	..
Jamaica	..	6,378	12,839	25,964	29,761	24,840
Kingston	..	357	..	353	..	2,540
Lavand (Jamaica)	..	..	302	..	..	..
Manzanilla	..	331	..	..	..	..
Maatanzas (Cuba)	..	3,436	2,677	7,655	6,235	7,017
Martinique	..	248	14,004	23,506	38,744	21,085
Montserrat	..	295	859	753	..	220
Nassau, N. P.	..	..	11,924	40,051	..	..
Neuritas (Cuba)	..	..	1,545	..	..	616
Port Royal	..	..	340	..	..	..
Port-au-Prince	..	..	..	712	2,165	2,136
Port-de-France (Ga.)	..	..	..	..	580	724
Porto Rico	..	1,252	3,014	5,725	4,651	1,969
Sague-la-Grande	..	..	..	713	435	553
St. Domingo	..	..	..	4,870	..	..
St. Francois	..	..	..	..	..	216
St. Jago-de-Cuba	..	380	4,312	20,711	5,327	6,549
St. John's	..	..	..	..	200	..
St. Lucia	..	..	..	..	328	..
St. Martin	..	..	179	450	385	523
St. Pierre (Martq.)	..	77	..	..	..	..
St. Thomas	..	45,196	42,549	50,889	45,123	18,032
St. Vincent	..	6,539	5,579	1,056	350	1,801
Samana Bay	..	..	..	8,123	..	..
Santiago-de-Cuba	..	..	..	2,893	714	..
Sombrezo	..	..	..	265	..	1,423
Trinidad	..	993	..	2,121	..	544
Trinidad-de-Cuba	..	..	894	2,789	6,842	266
Willemstad	..	..	..	..	..	175
Other Ports	132,915	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
NORTH AMERICA.						
Apalachicola	..	..	..	876	..	..
Baltimore	..	..	..	..	641	..
Bathurst (N.B.)	..	473	335	669	..	..
Belize	..	..	82	..	..	..
Boston (U.S.)	..	..	5,125	9,427	..	..
Charleston	..	420	..	..	153	..
Charlotte Town	..	644	115	..	..	..
Forleaux	..	100	..	..	..	..
Gaspé	..	136	..	148	..	..
Halifax (N.S.)	..	1,723	13,667	8,492	3,371	7,305
Harbor Grace	..	..	464	..	609	395
Montreal	..	..	450	5,713	534	1,889
Newfoundland	..	463	..	130	397	861
New Orleans (U.S.)	..	..	..	..	..	1,780
New York (U.S.)	..	13,338	45,118	55,477	10,596	2,638
Portland (U.S.)	..	3,094	3,868	8,092	5,929	..
Quebec	..	19,134	19,407	25,180	35,481	28,914
Port Stanley	..	..	..	..	..	326
St. Catherine's	..	984	..	716	3,654	6,425
St. John's (N.F.)	..	560	675	474	3,696	5,001
St. John's (N.B.)	..	590	731	455	978	..
San Francisco	..	5,124	3,162	4,397	1,200	1,388
Savannah	..	..	..	..	922	..
Vancouver's Island	..	..	1,538	..	..	..
Other Ports	29,591	..	..	..	..	..
SOUTH AMERICA.						
Acapulco	..	..	3,322	..	..	3,817
Arica	..	..	502	..	..	..
Aspinwall	..	..	510	462	3,026	5,463
Bahia	..	24,947	19,508	20,898	27,253	36,848
Berbice	..	..	..	..	826	1,144
Buenos Ayres	..	3,659	3,423	4,849	13,125	34,429
Caldera	..	9,528	13,331	12,000	3,701	2,468
Callao	..	14,968	10,879	15,943	17,273	24,383
Ceara	..	670	..	..	..	..
Chanaral	..	352	..	..	..	..
Cobija	..	..	1,461	..	..	..
Coquimbo	..	12,141	8,051	7,336	5,302	9,444
Curacoa	..	..	..	1,578	296	299
Demarara	..	690	2,184	1,194	3,296	7,896
Fray Bentos	..	..	..	..	552	2,418
Frontera-de-Tobasco	..	..	..	180	..	..
Granada	..	..	..	..	..	1,221
Guayacan	..	330	..	..	1,339	..
Guayaquil	..	..	..	8	..	..
Herradura	..	..	781	..	..	..
Huasco	..	764	..	330	..	..
Islay	..	..	..	..	..	62
La Guayra	..	..	..	..	..	200
Macao	..	..	..	..	..	365
Maracaybo	..	..	3,516	..	..	..
Maranham	..	9,619	6,443	5,453	5,471	8,371
Monte Video	..	15,811	21,843	31,097	10 6,715	160,838
Panama	..	1,901	3,605	726	3,096	3,977
Para	..	3,735	1,708	3,284	5,953	3,760
Payta	..	1,782	635	850	..	3,329
Pernambuco	..	3,005	6,408	6,298	6,589	11,469
Puerto Cabello	..	..	..	..	111	..
Quimper	..	..	..	..	63	..
Rio de la Plata	..	..	..	330	..	..
Rio Grande	..	189	1,768	2,061	4,130	11,694
Rio Grande de Sul	..	..	..	1,038	..	..
Rio Janeiro	..	52,628	38,012	49,338	65,301	94,190
River Plate	..	..	..	..	2,125	541
Rosario	..	..	..	350	1,915	1,442
Santa Catherine	..	..	512	..	..	..
Santa Cruz	..	195	359	..	601	..
Santos	..	52	..	133	3,123	5,139
Tocofilla	..	..	..	..	..	1,390
Valparaiso	..	6,846	17,351	23,931	39,182	45,605
Vera Cruz	..	..	3,178	369	..	..
Waakenham	..	..	..	..	..	338
Other Ports	118,678	..	..	..	..	..
CHANNEL ISLANDS.						
Alderney	..	68	..	96	130	70
Guernsey	..	816	972	581	530	469
Jersey	..	3,026	3,675	3,339	5,065	5,290
Sark	..	..	..	..	60	..
Other Ports	5,269	..	..	..	..	..
ICELAND.						
Reikavik	..	..	..	..	190	..
Skaulsvig	..	..	..	..	..	217
Other Ports	..	..	..	..	..	48
AZORES.						
Fayal	..	369	2,283	929	3,747	3,439
Saint Michael's	..	560	643	1,094	..	..
Terceira	..	..	204	1,911	..	..
Other Ports	1,782	..	..	..	..	..
CANARIES.						
Canary Island	..	..	368	..	322	..
Palmas	..	..	1,437	746	481	..
Teneriffe	..	4,138	9,187	8,052	6,020	7,503
Other Ports	396	..	..	..	..	..
MADEIRA.						
Funchal	9,543	6,883	9,209	21,316	..	12,961

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No. 4.—Export of Coal from the Western Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
SAINT HELENA	1,248	..	342	1,213	..	..
ASCENSION ISLAND	585	3,433	2,469	640	5,491	2,219
FALKLAND ISLANDS	..	..	813	738	..	..
Stanley	..	..	..	..	645	..
NEW ZEALAND.						
Auckland	..	100	..	..	..	..
Nelson	..	..	1,009	..	..	..

General Summary of Coal exported from the Western Coal Fields during the under-mentioned Years.

Name of Country to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France	354,364	360,937	507,331	514,069	848,927	873,116
Denmark	19,407	21,977	37,369	41,610	42,563	45,903
Norway	2,112	1,364	552	1,420	4,776	7,616
Sweden	3,865	4,223	2,745	4,965	2,010	4,087
Russia	34,110	49,363	38,310	53,703	55,506	43,023
Austria	38,905	42,808	28,754	42,426	26,610	41,904
Germany	38,058	22,854	27,030	17,073	34,338	41,203
Prussia	7,200	12,660	6,938	12,079	14,434	13,254
Holland	2,396	3,230	1,443	1,675	2,467	2,297
Belgium	2,018	2,907	..	998	2,742	992
Spain	125,033	199,854	216,397	244,414	211,033	220,893
Portugal	13,231	28,724	29,017	33,114	45,359	49,651
Italy	47,086	69,268	142,977	196,621	158,920	175,144
Mediterranean	144,680	178,293	172,773	254,911	242,886	231,586
Greece	8,774	16,358	21,105	13,749	22,063	24,175
Turkey	75,233	92,300	81,605	107,321	137,408	132,311
Africa	73,920	96,816	124,183	165,148	244,680	233,583
Australia	6,241	10,042	6,039	2,768	1,656	6,503
East Indies	85,323	180,769	158,603	104,554	290,422	223,975
West Indies	132,905	120,220	232,828	331,393	249,512	195,079
North America	29,591	36,633	93,747	126,230	68,093	56,623
South America	118,678	168,262	169,760	188,944	324,453	487,554
Channel Islands	5,269	3,910	4,647	4,016	5,785	5,820
Iceland	..	..	..	..	190	257
Azores	1,782	929	3,129	3,934	3,747	3,439
Canaries	396	4,138	10,892	8,798	6,823	7,503
Madeira	9,543	6,888	9,209	21,216	..	12,201
Ascension	585	3,433	2,469	640	5,491	2,219
St. Helena	1,248	..	342	1,213	..	..
Falkland Islands	..	..	813	738	645	..
New Zealand	..	100	1,009	..	..	..
Total Exports	1,381,953	1,739,260	2,132,016	2,493,740	3,053,539	3,141,971

No. 5.—Export of Coal from the SCOTCH PORTS to Foreign Countries from 1858 to 1868.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FRANCE.						
Abbeville	..	..	270	..	..	..
Antebes	..	..	..	..	..	230
Basse Indre	..	..	75	..	..	..
Bayonne	755	2,484	1,277	1,845	6,016	4,079
Benic	..	80	..	..	..	..
Blaye	..	105	..	..	..	530
Bordeaux	6,276	13,541	7,831	13,554	9,386	9,313
Boulogne	240	2,628	3,599	1,358	4,375	3,775
Brest	134	..	401	86	164	242
Caen	48	338	1,152	..	2,890	4,658
Calais	50	..	160	..	290	2,806
Cette	..	..	17	200	455	..
Charente	2,304	1,734	2,819	4,851	5,047	6,390
Conquet	..	..	51	..	..	..
Courcon	..	..	..	..	171	..
Croisset	..	238	..	..	..	..
Dieppe	4,455	5,296	8,191	7,291	4,967	4,868
Dunkirk	984	708	899	1,453	3,042	1,448
Eu	..	310	..	..	..	..
Fecamp	..	..	..	..	519	1,980
Granville	..	144	..	116	50	65
Gravelines	..	..	125	298	306	1,545
Havre	60	10	461	1,729	5,978	6,206
Havre-de-Grace	..	346	..	..	..	..
Honfleur	..	..	..	..	1,772	2,195
L'Orient	..	..	45	60	..	..
La Rochelle	10	220	100	142	510	692
Landerneau	..	..	..	57	3,420	..
Lucon	..	184	145	..	..	..
Marans	120	125	..	..	..	..
Marseilles	60	3,561	3,061	5,223	476	1,103
Nantes	2,455	4,642	5,123	8,730	6,781	7,246
Paimbouf	..	..	..	..	135	..
Point-aux-Herbes	..	..	..	420	..	..
Point-au-de-Mer	..	..	76	..	227	..
Ponterson	..	..	..	..	893	700
Regneville	..	..	175	..	..	..
Roche Barnard	..	..	..	..	..	139
Rochfort	..	272	660	575	451	..
Rouen	2,129	1,072	1,381	424	4,866	6,954
St. Andre de Cubzac	..	..	..	..	..	396
St. Brieux	..	..	..	..	145	280
St. Malo	..	..	..	..	1,619	2,101
St. Nazaire	..	..	..	240	1,162	1,729
St. Vaast	..	..	..	..	136	..
St. Valery	..	..	..	..	464	616
St. Valery-en-Caux	..	..	127	..	..	..
St. Valery-sur-Somme	..	..	339	..	..	803
St. Felix	..	..	..	..	..	220
St. Jean de Lus	..	..	..	..	..	164
Treport	..	172	..	..	..	..
DENMARK and the DUCHIES.						
Aalborg	..	1,802	1,826	1,166	870	4,470
Aaroeskjobing	..	210	..	..	..	..
Aaroesund	..	..	..	..	73	74
Aarhuus	8,395	6,769	8,909	8,903	15,024	14,601

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
DENMARK, &c.—*cont.*						
Allinge	..	..	..	59	..	..
Altona	..	..	946	169	..	..
Apenrade	..	110	256	..	..	..
Arnies	..	..	85	..	..	..
Assens	105	230	341	205	..	170
Ballum	..	..	..	..	..	185
Bandholm	1,069	244	754	313	573	712
Bogense	..	..	203	741	245	170
Bornholm	..	..	..	630	114	211
Callundborg	..	..	293	..	..	..
Cappeln	..	129	276	222	100	160
Copenhagen	13,162	15,154	15,983	17,927	19,389	19,921
Dangaard	..	..	..	255	..	..
Eckenforde	..	422	135	293	439	845
Ebeltoft	..	105	329	93	356	103
Eeroeskjobing	..	..	75	561	..	62
Ekensand	..	..	130	..	..	..
Elsinore	345	1,544	933	2,033	3,538	2,217
Faaborg	..	196	180	1,289	83	1,962
Fance	..	..	..	195	..	..
Faroe	..	..	149	..	120	..
Faro Sound	..	..	140	..	..	..
Fayo	..	121	..	..	290	689
Fehmern	..	..	77	106	..	2,600
Fleckenforde	..	..	110	..	..	..
Flensborg	2,815	3,090	3,377	1,766	7,512	10,417
Fohr	..	..	..	..	..	90
Fredericia	179	276	616	413	1,483	3,644
Frederickshaven	3,071	760	757	1,695	567	1,454
Fredericksstadt	..	683	100	165	827	1,406
Fredericksund	..	..	..	116	278	127
Fredericksvoerk	..	..	..	91	259	464
Gluckstadt	118	..	..	123	..	116
Grennaae	..	..	..	..	..	196
Hadersleben	272	160	234	..	..	..
Hadersley	..	..	124	285	149	355
Helingenhafen	..	94	158	232	140	..
Heslingen	..	..	324	..	..	..
Hielsminde	..	..	..	70	..	..
Hjarbeck	..	..	22	..	..	..
Hobroe	..	175	309	..	..	204
Holbeck	369	184	445	825	867	770
Holnis	..	60	..	140	..	538
Holstein	..	..	..	178	160	..
Horsens	3,298	4,100	5,403	4,335	5,812	10,251
Howacht	..	..	..	..	..	146
Hoyer	..	..	..	..	..	58
Husum	..	..	..	..	55	669
Jsefjord	..	..	..	..	..	139
Kallundborg	..	100	..	200	150	146
Karrebecksminde	552	284	..	..	148	..
Kastrup	..	..	..	..	..	275
Kiel	921	2,012	907	2,528	3,661	5,347
Kjertiminde	..	..	..	..	..	521
Kjoge	..	199	499	291	25	283
Kolding	1,419	934	879	574	643	1,569
Korsoer	4,838	1,955	3,204	3,548	2,680	6,356
Logstor	..	60	..	..	497	310
Lokken	..	72	..	..	208	91
Lonstrup	..	..	..	..	75	..
Mariager	..	..	..	..	115	..
Marstall	..	..	..	363	90	88
Middlefahrt	..	175	335	540	569	424

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No. 5.—Export of Coal from the Scotch Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Denmark, &c.—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Mullerup	..	..	..	..	..	947
Nakskov	1,062	775	1,100	1,432	886	2,746
Nestved	..	52	282	223	..	513
Langore	..	..	..	..	..	106
Nexoe	..	..	..	..	..	115
Nibe	..	..	110	..	..	170
Nivaa Baya	..	..	..	..	..	959
Novaargaard	..	..	126	..	..	..
Nyborg	315	146	476	755	564	996
Nyekjobing	312	464	109	538	..	1,033
Nysted	..	106	..	62	..	..
Odense	1,776	1,665	2,220	3,279	3,566	4,962
Pahlude	..	..	154	116	141	..
Praestø	..	..	186	357	496	747
Randers	1,407	1,041	1,908	1,608	3,262	3,607
Rendsborg	115	601	885	167	252	483
Rinkjobing	..	52	..	..	..	..
Rodvighaven	..	..	..	..	..	126
Roeskilde	391	607	952	581	559	956
Ronne	..	259	..	385	165	..
Rorvig	..	135	106	63	141	..
Rudkjobing	70	82	..	251	361	464
Samsoe	..	113	..	203	..	223
Saxilde	..	..	..	..	158	114
Saxjobing	..	..	..	186	100	150
Schlekkifiord	..	..	110	..	..	..
Schlesvig	..	..	..	..	..	335
Shahhausersiel	..	..	120	..	..	..
Sidofield	..	120	..	..	..	..
Skive	..	154	..	..	309	82
Skjelsker	270	342	450	416	251	948
Skodsburg	..	222	150	..	..	..
Slipshaven	..	..	..	233	..	..
Sonderborg	..	195	75	800	88	86
Stege	..	627	362	604	893	1,031
Struer	..	..	..	..	98	90
Stubbeckjobing	..	54	136	92	105	236
Svanike	..	..	..	..	120	..
Svendborg	352	711	190	733	1,214	342
Thisted	..	121	104	..	30	531
Tonning	4,820	2,839	355	1,363	90	128
Tonningen	1,200	170	..	..	..	..
Warde	..	80	45	..	..	..
Weile	955	705	496	406	702	874
Wordingborg	..	..	150	..	..	224
Wyck	..	..	..	..	93	..
Other Ports	3,877	..	..	..	..	..
NORWAY.						
Aalesund	..	..	..	571	95	..
Aasgaardstrand	..	60	361	60	..	..
Altongaard	..	169	..	..	..	..
Arendhal	..	515	731	698	159	212
Bergen	5,125	5,160	8,445	7,540	7,517	5,645
Bodoe	1,661	2,992	..	736	2,356	340
Brevig	..	442	54	..	..	..
Christiania	10,422	25,551	23,096	26,803	31,352	33,202
Christiansand	5,062	3,562	2,927	4,841	5,054	6,105
Christiansund	468	844	648	705	212	..
Dram	440	1,233	2,022	296	524	1,829
Drammen	1,131	2,031	814	2,004	3,271	2,824
Droback	..	..	..	..	..	267
Drontheim	4,525	1,877	212	1,238	1,456	838
Egersund	..	71	120	108	150	430
Farsund	..	..	..	..	..	250
Flekkifiord	..	470	..	548	326	56
Frederickshold	2,325	3,162	1,940	1,290	2,458	2,217
Fredericksvoern	..	516	100	350	..	..
Grimstadt	..	..	..	85	59	85
Hammerfest	1,022	3,339	2,082	2,365	1,834	4,222
Hangesund	..	..	..	160	..	207
Holmstadt	..	353	172	..	151	..
Holmstrand	..	585	436	170	426	420
Hovig	..	240	..	..	..	..
Horten	140	190	15	880	666	996
Jessefjord	..	..	181	..	226	111
Kjollefjord	..	..	..	..	530	..
Krageroe	..	..	100	170	260	..
Langesund	..	107	..	..	..	..
Lourvig	..	812	1,371	149	731	913
Loffoden	..	..	..	..	110	62
Mandhal	..	63	2,162	2,409	1,350	2,344
Molde	..	313	..	99	..	..
Moss	448	470	520	885	240	400
Namsas	..	..	42	..	110	145
Oster Risoer	..	131	40	281	..	..
Porsgrund	..	..	78	46	192	170
Rosendahl	..	..	..	..	115	..
Sandifjord	..	264	191	566	604	869
Sarpsborg	..	..	..	..	..	25
Seidesfjord	..	..	..	..	225	..
Skien	..	213	480	..	..	..
Soggendahal	..	..	..	..	..	90
Stavanger	616	137	927	1,579	1,770	2,718
Tonsberg	678	1,383	2,098	1,262	1,561	971
Tromsoe	2,356	2,359	556	393	3,685	3,660
Tvedestrande	..	393	..	..	..	..
Vardoe	..	..	..	..	715	..
Wadsoe	..	..	..	128	428	1,507
Wardoe	..	376	..	..	..	..
Other Ports	3,075	..	..	..	..	..
SWEDEN.						
Ahns	..	..	280	..	385	499
Calmar	..	..	..	..	81	..
Cimbritshamn	..	..	..	..	150	..
Engelholm	..	..	..	..	..	140
Gottenborg	1,244	1,031	796	3,640	4,588	6,950
Gothlam	..	..	..	379	382	..
Gustafsburg	..	544	2,180	786	1,674	1,085
Helsingborg	..	128	..	190	254	696
Landscrona	328	214	..	..	472	698

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
Sweden—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Malmo	1,635	1,082	560	1,234	2,136	2,763
Nordkjobing	..	..	..	..	190	..
Norkoping	..	..	120	..	589	608
Oscarhamn	..	..	..	..	..	75
Sodertelge	..	..	..	230	..	..
Stockholm	1,750	5,289	5,580	5,755	3,845	8,024
Sundsvall	..	..	..	..	..	700
Trelleborg	..	..	..	..	..	754
Uddevalla	40	..	..	..	694	132
Umea	..	..	119	..	..	..
Westerwick	..	..	15	..	..	120
Ystadt	..	..	..	..	..	815
Other Ports	30	..	..	..	..	..
RUSSIA.						
Alexandrovski	..	..	400	..	..	..
Archangel	..	272	619	195	..	..
Batoum	..	..	..	..	..	5,088
Bjorneborg	..	..	..	771	198	..
Bolderaa	..	..	..	..	..	660
Cronstadt	17,844	6,099	5,969	9,585	12,374	20,147
Helsingfors	..	16	..	..	..	..
Kertch	..	..	..	..	..	9,739
Libau	..	..	480	308	..	..
Narva	..	..	170	..	120	..
Odessa	1,217	1,091	9,371	7,004	18,789	35,953
Pornau	..	300	310	323	..	..
Revel	1,686	..	..	..	..	..
Riga	2,535	2,828	4,680	4,012	9,526	1,283
St. Petersburgh	3,455	2,524	2,587	781	3,941	746
Sebastopol	..	..	..	..	..	2,369
Taganrog	..	..	..	..	596	500
Uleaborg	..	..	..	..	..	250
Wiborg	..	42	..	..	156	..
Other Ports	300	..	..	..	..	..
AUSTRIA.						
Fiume	426	..	..	..	..	..
Pola	..	120	..	..	..	..
Trieste	8,149	8,352	7,162	4,392	3,023	8,846
Venice	1,448	978	244	183	603	1,241
GERMANY.						
Besserup	..	..	..	..	..	291
Brake	1,921	4,538	2,988	2,989	280	463
Bremen	4,364	2,932	2,868	62	..	559
Bremerhafen	130	721	..	1,590	611	220
Brunshausen	..	..	95	..	..	..
Carolynenshyl	..	56	..	..	..	..
Cuxhaven	..	..	..	..	..	5
Elafleth	..	..	..	96	..	..
Emden	396	803	408	110	85	..
Farge	..	1,796	1,316	..	..	..
Fargo	..	240	60	..	..	..
Geestemunde	..	..	..	..	384	400
Hamburg	3,705	7,997	9,142	4,586	8,043	9,768
Hanover	..	100	154	..	..	..
Harburg	2,256	2,298	269	134	417	547
Leer	174	235	318	..	375	899
Lubeck	1,817	4,911	4,358	5,828	4,914	6,606
Mariensiel	..	67	..	..	..	..
Neumagen	..	..	..	..	..	402
Neustadt	547	353	858	464	1,614	1,539
Norden	76	58	53	120	60	93
Oldenburg	..	256	..	..	..	..
Papenburg	..	..	75	..	..	..
Rostock	8,119	8,783	14,785	6,175	15,302	13,378
Sarsted	..	..	..	..	..	120
Sandstedtersiel	..	..	..	..	..	116
Travemunde	675	651	..	..	..	..
Varel	477	159	..	148	120	569
Warnemunde	..	320	..	..	..	..
Wischaven	..	..	..	..	..	395
Wismar	3,184	3,426	3,839	3,450	7,869	4,967
Other Ports	225	..	..	..	..	..
PRUSSIA.						
Anclam	..	..	150	..	..	..
Burg	..	96	..	..	..	148
Colberg	50	90	353	..	..	..
Dantzic	1,982	4,269	9,231	11,929	24,884	42,880
Fairwater	..	..	..	..	396	..
Greifswalde	..	70	25	690	670	959
Konigsberg	1,908	3,125	5,586	2,352	5,693	2,829
Lissa	..	..	1,148	..	..	..
Memel	1,724	5,541	3,633	2,505	6,424	9,358
Pillau	815	791	1,230	1,105	780	704
Stettin	4,361	3,455	7,877	4,866	8,452	4,067
Stralsund	1,512	1,219	3,490	1,805	1,486	693
Swinemunde	2,396	1,050	3,330	240	5,904	2,308
Wolgast	1,378	3,535	2,848	3,721	148	7,065
HOLLAND.						
Amsterdam	148	619	830	613	1,148	1,063
Dordt	50	..	..	..	..	..
Flushing	..	..	..	84	..	..
Groningen	80	..	..	..	..	..
Harlingen	1,187	1,534	1,557	754	1,375	1,156
Hellevoetsluys	..	560	..	..	..	..
Koorn	..	..	263	..	..	..
Middleburg	..	..	..	349	..	..
Rotterdam	1,095	3,436	2,900	559	1,687	4,536
Zwolle	..	..	304	..	..	..

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No. 5.—Export of Coal from the Scotch Ports—*continued.*

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
BELGIUM.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Antwerp	620	1,180	3,457	786	1,300	1,270
Bruges	..	1,782	2,380	2,145	2,990	5,628
Brussels	..	164	236	114	..	..
Ghent	..	..	..	68	..	472
Nieuport	..	..	..	..	..	118
Ostend	..	1,255	1,426	356	1,420	5,923
SPAIN.						
Alicante	..	32	411	184	1,711	..
Almeira	..	..	203	..	..	..
Barcelona	429	729	781	605	901	230
Bilboa	..	20	258	813	563	390
Cadiz	2,414	2,207	2,138	1,806	1,097	1,028
Carthagena	..	..	..	863	..	357
Corunna	..	..	477	..	..	..
Huelva	..	..	..	..	..	1,093
Malaga	3,267	7,422	4,220	5,592	2,515	5,734
Motril	..	..	..	185	..	..
Palamos	..	..	..	..	..	635
Passages	..	..	..	315	..	..
San Felix Quixoles	..	..	..	..	..	228
San Sebastian	..	110	21	..	..	..
Santander	..	791	339	423	871	435
Seville	30	300	1,096	2,651	793	603
Tarragona	..	..	..	311	..	..
Torre-del-Mar	..	771	..	1,182	..	..
Valencia	..	..	320	..	..	..
Vigo	..	..	430	..	..	..
Other Ports	261	..	..	..	..	..
PORTUGAL.						
Lisbon	953	3,218	3,420	10,275	8,473	6,447
Oporto	..	..	..	..	4,266	1,925
Viana	..	40	..	..	3	..
Other Ports	20	..	..	..	..	..
ITALY.						
Ancona	52	..	632	516	3,337	1,492
Bari	..	..	..	..	1,169	..
Brindisi	..	..	..	..	..	640
Castellamare	..	..	..	..	1,281	..
Civita Vecchia	426	129	184	250	1,446	1,503
Genoa	8,114	15,396	23,174	45,942	26,181	28,781
Leghorn	250	..	535	..	1,790	1,451
Naples	1,065	1,703	3,230	24,495	11,529	12,254
Nice	106	..	122	..	..	226
Savonia	..	..	150	104	..	..
Spezzia	..	..	..	1,953	..	..
Venice	..	..	..	..	125	..
Villa Franca	..	..	298	..	..	..
MEDITERRANEAN SEA.						
Cagliari	..	..	..	450	..	1,204
Candia	..	..	..	..	655	..
Corfu	6,036	4,563	8,055	1,524	1,122	1,927
Gibraltar	2	320	220	..	2,258	2,792
Malta	667	1,552	157	14,234	3,450	2,722
Messina	500	385	552	213	3,222	3,811
Palermo	572	603	492	562	1,518	1,998
Saide	..	..	..	..	510	..
Taxo	..	..	120	..	..	..
Zante	..	500	..	..	2,901	..
GREECE.						
Athens	1,057	..	..	..	570	510
Carlo Forte	..	..	..	..	..	314
Patras	153	..	..	..	..	..
Spezzia	..	..	..	..	1,275	447
Syra	4,514	2,007	3,099	953	296	847
TURKEY.						
Beyrout	1,201	155	1,248	..	..	..
Constantinople	12,365	7,110	4,212	2,210	5,674	12,567
Galatz	290	1,038	206	930	..	1,229
Ragusa	423	1,158	1,165	..	..	..
Rhodes	2,016	473	..	..	..	..
Salonica	1,145	1,380	..	..	..	..
Savonia	..	..	..	..	..	220
Smyrna	4,771	1,604	876	..	..	..
Suda	..	..	..	..	2,294	..
Sulina	..	..	500	..	..	..
Other Ports	880	..	..	..	..	..
AFRICA.						
Alexandria	..	1,534	1,135	895	12,282	6,563
Algiers	..	212	592	400	410	2,158
Algoa Bay	..	..	..	40	..	..
Banana Islands	..	..	..	..	..	420
Bona	..	..	..	160	..	..
Cape of Good Hope	..	110	1,007	335	893	..
Cape Town	..	100	..	..	..	..
Egypt	..	..	..	380	..	..
Jellia Coffee	..	..	..	..	..	727
Port Natal	..	146	275	79	..	123
Port Said, Egypt	..	..	..	4,817	..	438
Storah	..	..	..	..	487	..
St. Paul de Loando	..	..	250	50	100	319
Tunis	..	..	..	..	1,108	242
Zanzibar	..	..	..	291	10	..
Other Ports	5,927	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
AUSTRALIA.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Adelaide	..	50	632	351	..	..
Brisbane	..	..	300	..	..	..
Hobson's Bay	..	..	..	260	..	..
Melbourne	..	546	50	220	50	50
Other Ports	1,268	..	..	..	..	..
EAST INDIES.						
Aden	..	2,268	..	..	..	7,988
Andaman Isles	..	..	..	..	..	1,466
Batavia	..	104	558	990	495	300
Bombay	..	3,104	2,692	11,875	24,434	29,999
Calcutta	..	4,905	3,940	3,237	3,205	3,059
Ceylon	..	230	50	700	..	..
Cochin	..	..	..	507	..	..
Cocanada	..	..	..	..	619	778
Colombo	..	..	..	..	145	245
Cheo Po	..	..	..	..	600	..
Hong Kong	..	..	400	925	632	648
Java	..	..	..	..	..	300
Kurrachee	..	516	1,366	4,756	3,093	3,961
Macassar	..	50	..	..	..	..
Madras	..	610	706	587	1,052	265
Manilla	..	..	..	..	..	1,091
Mauritius	..	605	1,953	2,718	2,623	5,321
Moulmein	..	1,750	200	500	..	..
Muscat	..	..	..	1,806	3,426	1,554
Negapatam	..	40	..	..	..	..
Penang	..	200	..	..	459	1,267
Point-de-Galle	..	710	..	2,535	2,068	3,066
Rangoon	..	600	65	415	5,168	3,342
Rhio	..	..	365	..	..	..
Samarang	..	..	56	..	24	50
Marion	..	..	..	..	..	95
Shanghae	..	..	3,097	892	463	218
Singapore	..	400	420	2,268	3,691	3,704
Sourabaya	..	205	..	1,700	1,710	300
Yokohama	..	..	..	..	450	653
Other Ports	5,914	..	..	..	..	..
WEST INDIES.						
Antigua	..	52	46	158	77	125
Barbadoes	..	2,823	3,905	3,739	6,519	6,193
Bermuda	..	153	..	..	..	..
Belize	..	..	..	156	..	..
Cardenas	..	473	1,570	5,345	7,221	8,602
Cienfuegos (Cuba)	..	..	420	..	517	319
Colon	..	..	..	561	..	..
Cuba	..	1,020	5,141	2,960	4,358	4,515
Dominica	..	..	..	..	..	3,715
Falmouth	..	..	..	..	200	..
Grenada	..	215	333	..	..	..
Havannah (Cuba)	..	8,800	19,768	20,626	17,978	21,711
Hayti	..	..	..	679	..	..
Jamaica	..	2,055	1,330	1,995	300	453
Kingston	..	101	..	560	..	79
Matanzas (Cuba)	..	8,542	15,789	15,978	14,625	25,282
Martinique	..	..	..	..	462	1,000
Nassau, N.P.	..	..	920	..	..	..
Neuritas, Cuba	..	..	337	..	..	..
Port-au-Prince	..	..	120	..	..	360
Porto Rico	..	268	1,485	1,070	1,144	..
Sague-la-Grande	..	44	125	760	..	360
Saint Jago-de-Cuba	..	530	831	868	4,614	2,457
Saint Kitts	..	146	214	..	..	145
Saint Thomas	..	2,520	3,853	7,670	12,969	600
Saint Vincent	..	15	..	..	..	..
Tobago	..	..	..	..	..	10
Trinidad	..	4,600	7,129	2,693	4,844	4,229
Trinidad-de-Cuba	..	..	156	..	1,054	821
Other Ports	32,237	..	..	..	..	..
NORTH AMERICA.						
Baltimore	..	..	600	..	..	696
Bangor, U.S.	..	..	350	..	..	..
Boston, U.S.	..	4,231	902	100	1,538	1,064
Cambridge, N.S.	..	485	..	..	..	..
Charlotte Town	..	..	..	..	119	115
Dalhousie, N.B.	..	..	220	..	300	..
Halifax, N.S.	..	1,423	4,475	1,533	301	115
Harbor Grace	..	320	..	..	..	..
Honduras	..	600	..	..	..	..
Liverpool, N.S.	..	..	..	323	..	..
Lymford	..	..	..	..	150	..
Montreal	..	250	7,952	2,387	1,071	2,972
Miramichi	..	250	498	230	346	184
Newfoundland	..	2,401	5,121	4,369	1,328	713
New London, U.S.	..	..	..	4,715	..	..
New Orleans, U.S.	..	1,062	..	..	100	150
New York, U.S.	..	2,004	24,234	..	24	2,109
Norfolk	..	1,319	..	..	..	..
Otaga	..	..	..	..	..	..
Philadelphia	..	385	402	..	..	..
Picton, N.S.	..	..	200	..	..	..
Portland, U.S.	..	..	..	40	..	..
Providence, U.S.	..	..	1,720	2,552	50	30
Quebec	..	100	..	..	..	..
Richibucto	..	30,082	40,247	38,327	42,673	69,918
Saint Andrew	..	45	120	..	..	60
Saint John's, N.F.	..	..	500	..	..	..
Saint John's, N.B.	..	360	310	..	1,844	4,046
San Francisco	..	7,600	5,219	6,989	3,614	10,371
Savannah	..	..	26	1,292	492	1,151
Shediar, N.B.	..	1,949	..	..	1,161	310
Virginia	..	..	..	400	..	..
Weymouth, N.S.	..	..	..	..	413	..
Yarmouth, N.S.	..	..	137	..	..	..
Other Ports	46,034	386	779	..	733	..

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No. 5.—Export of Coal from the Scotch Ports—*continued*.

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
SOUTH AMERICA.						
Acapulco	..	..	..	..	4,132	..
Bahia	..	365	464	2,758	2,537	5,836
Berbice	..	396	1,539	1,295	2,729	3,074
Brazil	..	572	..	335	..	..
Buenos Ayres	..	872	2,690	3,491	4,351	2,367
Buena Ventura	..	..	..	..	1,709	..
Callao	..	..	..	..	535	271
Demarara	..	12,915	16,892	22,365	21,787	32,143
Fray Bentos	..	..	..	..	382	90
Iquique	..	..	..	..	..	719
Lima	..	..	..	..	120	..
Maroim	..	..	..	..	..	211
Monte Video	..	1,956	1,553	2,726	5,709	4,848
New Grenada	..	..	..	..	682	..
Paramariba	..	..	260	..	..	551
Pernambuco	..	687	1,481	612	4,681	3,204
Rio Grande	..	..	41	376	334	60
Rio Grand de Norte	..	..	..	..	31	..
Rio Grande de Sul	..	..	20	298	464	608
Rio Janeiro	..	322	729	858	125	3,265
Rosario	..	..	..	..	37	150
Santos	..	200	110	..	..	300
Surinam	..	927	946	609	557	831
Tobago	..	..	..	..	80	..
Torre-de-Mar	..	..	..	..	298	..
Valparaiso	..	676	686	2,537	4,064	1,723
Vera Cruz	..	..	..	..	530	..
Other Ports	28,982	..	..	..	..	..
CHANNEL ISLANDS.						
Guernsey	..	..	..	211	..	400
Jersey	..	466	527	495	1,966	1,609
Other Ports	248	..	..	..	..	..
ICELAND.						
Bernfiord	..	540	122	225	1,289	..
Reikavik	..	..	..	..	88	..
Other Ports	..	..	..	..	..	823
HELIGOLAND	..	..	..	..	..	270
AZORES.						
Fayal	..	..	..	..	135	..
MADEIRA.						
Funchal	151	..	450	..	12,028	..
SAINT HELENA	309	..	..	..	..	..

Name of Country and Port to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
NEW ZEALAND.						
Auckland	..	..	..	1,173	..	..
Canterbury	..	..	..	1,706	..	..
Dunedin	..	100	..	65	205	..
Otago	..	..	627	1,103	60	201
Port Chambers	..	..	80	1,168	..	..
Other Ports	515	..	..	..	..	..
Wellington	..	..	..	..	2,425	..
Yarmouth	..	..	..	..	30	..
Port Chalmers	..	..	..	..	..	200

General Summary of Coal exported from the Scotch Coalfields during the under-mentioned Years.

Name of Country to which exported.	1858.	1860.	1862.	1864.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France	20,178	38,232	38,540	47,612	67,243	78,455
Denmark	55,887	54,847	61,030	72,740	82,828	114,970
Norway	39,294	60,383	31,921	59,215	70,918	74,130
Sweden	5,027	8,288	9,450	12,214	15,440	23,999
Russia	27,017	13,172	24,646	22,979	45,500	76,535
Austria	10,023	9,350	7,406	4,575	3,626	10,084
Germany	28,066	49,700	41,586	25,752	39,954	41,273
Prussia	16,126	23,241	38,901	29,203	54,124	72,087
Holland	2,560	6,149	5,874	2,359	4,205	6,745
Belgium	620	4,381	7,499	3,469	5,716	13,416
Spain	6,401	12,382	10,754	14,900	8,451	10,796
Portugal	973	3,258	3,420	10,275	12,742	8,372
Italy	10,013	17,228	28,375	73,260	47,356	46,412
Mediterranean	7,777	8,128	9,596	17,009	15,536	13,454
Greece	5,524	2,007	3,099	953	2,138	3,118
Turkey	23,191	12,988	8,207	3,140	7,878	14,016
Africa	5,927	2,102	3,259	6,947	15,290	10,990
Australia	1,268	596	1,032	831	50	50
East Indies	5,914	16,306	15,848	36,213	59,557	72,104
West Indies	32,237	32,334	63,471	64,817	76,880	80,715
North America	48,034	55,312	94,021	63,647	56,349	93,998
South America	28,982	19,888	27,481	38,055	55,824	60,251
Channel Islands	248	466	527	706	1,936	2,009
Heligoland	..	..	..	225	..	270
Iceland	..	540	122	..	1,377	823
Azores	..	..	..	..	135	..
Madeira	151	..	450	..	12,028	..
St. Helena	309	..	..	..	..	..
New Zealand	515	100	707	5,216	2,720	461
Total Exports	382,262	442,328	557,172	616,312	765,803	928,696

No. 6.—Exports of Coal from LONDON to Foreign Ports in 1867 and 1868.

Country.	Ports.	1867.	1868.
		Tons.	Tons.
France	Caen	..	358
	Calais	440	..
	Cette	..	4
	Mossele Bay	186	76
	Bordeaux	..	250
	Dunkirk	..	1,451
	Havre	..	1
	Marseilles	..	720
Denmark	Fleckenford	225	..
	Nykejobing	809	..
	Svendborg	202	..
	Copenhagen	..	30
	Nyborg	..	204
Sweden	Gottemborg	30	60
	Oscarhamn	180	..
	Stockholm	60	..
	Christianstadt	..	80
	Hudiksvall	..	200
Russia	Odessa	1,220	..
	Batoum	..	647
	Wasa	..	25
Austria	Trieste	1,300	..
Prussia	Wolgast	4,024	..
Spain	Cadiz	220	..
Portugal	Oporto	1,115	2,325
	Lisbon	..	319
Italy	Genoa	..	100
Greece	Syra	150	420
	Athens	..	116

Country.	Ports.	1867.	1868.
		Tons.	Tons.
Turkey	Bussorah	400	..
	Constantinople	600	..
	Galatz	890	1,375
	Smyrna	1,040	..
	Kustendji	..	525
	Salonica	..	20
Africa	Algoa Bay	689	619
	Cape of Good Hope	3,562	3,414
	Port Beaufort	75	..
	Port Alfred	264	114
	Port Natal	445	119
	Zanzibar	505	159
	Alexandria	..	900
	Cape Town	..	67
	Lagos	..	89
	Mosambique	..	53
	Mogadore	..	85
	St. Paul-de-Loando	..	100
	Sierra Leone	..	60
	St. Nicholas, Cape Verd Islands	..	40
Australia	Adelaide	911	1,547
	Brisbane	50	..
	Hobart Town	..	21
	King George's Sound	..	2,221
	Melbourne	101	104
	Paramatta	..	60
	Port Adelaide	50	..
	Port Philip	78	359
	Swan River	108	175
	Sydney	197	513
	Wellington	83	..

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No. 6.—EXPORTS of COAL from LONDON—*continued.*

Country.	Ports.	1867.	1868.
		Tons.	Tons.
Mediterranean Sea	Corfu	..	50
	Gibraltar	..	1,174
	Licata	..	1,857
	Malta	..	150
	Palma	..	237
East Indies	Aden	2,462	3,923
	Amoy	300	..
	Bombay	2,375	19,872
	Batavia	150	342
	Bushire, Persia	595	1,450
	Cochin	50	..
	Colombo	218	309
	Calcutta	10,929	6,519
	Ceylon	..	211
	Chufoo	50	..
	Carwar	..	30
	Hong Kong	870	1,920
	Japan	717	350
	Karajawa	206	110
	Kurrachee	100	922
	Madras	373	271
	Mangalore	185	371
	Manilla	288	..
	Muscat	..	1,167
	Penang	1,562	2,485
	Point-de-Galle, Ceylon	2,353	..
	Nagasaki	..	300
	Negapatam	..	400
	Rangoon	175	1,650
	Shanghae	3,210	5,019
	Singapore	3,115	1,294
	Trincomalee, Ceylon	50	..
	Yokohama	120	2,056
	Tien-Tsin	..	125
West Indies	Antigua	208	216
	Barbadoes	495	901
	Bermuda	50	96
	Cardenas	..	696
	Caibarien, Cuba	190	..
	Cienfuegos	..	199
	Dominica	13	20
	Grenada	222	153
	Havannah	..	3,804
	Jamaica	956	860
	Martinique	..	40
	Porto Rico	89	367
	Matanzas (Cuba)	..	1,690
	St. Lucia	68	17
	St. Thomas	636	50
	St. Vincent	200	283
	St. Kitts	659	473
	Sombrero	300	..
	Tobago	541	452
	Trinidad	727	476
	St. Domingo	..	21
	Trinidad-de-Cuba	..	301
North America	Belize	18	110
	Boston	420	336
	Savannah	..	1,500
	Charleston	207	..
	San Francisco	..	100
	East London	21	42
	Halifax	..	42
	New York	40	1,934
	Mobile	..	2
	Newport	300	..
	New Richmond	200	..
	Philadelphia	5	..
	St. John's, N.B.	..	826
	Galveston	..	173
	St. John's, N. F.	..	564
South America	Aspinwall	..	280
	Berbice	2,186	1,272
	Bahia	..	175
	Buenos Ayres	1,080	1,265
	Callao	15	100
	Ceara	..	445
	Curacoa	..	117
	Demarara	4,236	5,717
	Guayaquil	18	..
	Greytown	..	100
	Macayo	22	..
	Monte Video	333	1,486

Country.	Ports.	1867.	1868.
		Tons.	Tons.
South America—*cont.*	La Guayra	..	19
	Natal	115	2,265
	Nickerie	130	185
	Panama	130	..
	Paramariba	..	87
	Pernambuco	358	836
	Rio Grande do Sul	..	22
	Rio Janeiro	207	1,768
	Santos	..	77
	Rosario	140	30
	Valparaiso	..	1,530
	Punta Arenas	..	64
	Rio Grande	..	198
	S. Juan de Los Remedios	..	352
Azores	Fayal	493	..
Canaries	Canary Island	643	..
	Teneriffe	199	..
	Other Ports	..	867
Madeira	Funchal	733	250
St. Helena		719	625
Falkland Islands	Stanley	70	
Channel Islands	Jersey	..	44
New Zealand	Auckland	170	40
	Canterbury	525	300
	Nelson	80	320
	Otago	249	..
	Wellington	248	465
	Yarmouth	30	..
	Other Ports	133	205
	Napier	..	10
	Invercargill	..	50
Sandwich Islands		50	..

GENERAL SUMMARY of COAL exported from the Port of LONDON during the under-mentioned Years.

Name of Country to which exported.	1867.	1868.
	Tons.	Tons.
France	636	2,860
Denmark	1,236	234
Sweden	270	340
Russia	1,220	672
Austria	1,300	..
Prussia	4,024	..
Spain	220	..
Portugal	1,115	3,644
Italy	..	100
Mediterranean	..	3,468
Greece	150	536
Turkey	2,920	1,920
Africa	5,540	7,818
Australia	1,578	5,000
East Indies	30,473	51,096
West Indies	5,349	11,115
North America	1,211	5,679
South America	8,960	15,382
Channel Islands	..	44
Azores	493	..
Canaries	843	867
Madeira	733	250
St. Helena	719	625
Falkland Islands	70	101
New Zealand	1,249	1,590
Sandwich Islands	50	..
Total Exports	70,348	115,142

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APPENDIX, TABLE No. 127.

COAL EXPORTS FOR 1869

Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
FRANCE.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ars	..	..	..	..	597	..
Angers	..	..	..	..	1,183	..
Arcachou	..	..	..	..	1,436	..
Andret	..	..	..	..	98	..
Auray	550	..	..	..	710	..
Aixier	130	..	..	..	..	..
Abbeville	1,383	..	..	..	..	..
Audierne	..	..	..	..	249	..
Barfleur	..	..	..	..	85	..
Boulogne	66,604	2,862	2	..	1,400	6,780
Bordeaux	88,891	3,784	55	10,163	79,753	6,935
Bayonne	14,725	..	..	137	4,562	7,592
Beauvoir	..	..	..	..	607	..
Benic	..	..	..	..	73	..
Basse Indre	330	..	..	..	3,803	..
Brest	7,483	..	..	..	12,170	40
Blaye	280	..	..	..	..	..
Belle Isle	..	..	..	..	340	..
Candebec	296	..	..	..	..	..
Calais	64,045	..	..	..	..	5,699
Croisic	..	..	..	..	1,320	..
Chateau	90	..	..	..	577	..
Caen	46,774	642	..	612	45,735	2,163
Charente	16,002	175	..	160	21,090	5,677
Chantenay	..	..	..	..	67	..
Conquet	735	..	..	..	755	100
Cherbourg	10,065	..	..	..	18,456	601
Courcon	..	..	..	..	280	..
Cannes	1,900	..	..	..	..	..
Concarneau	..	..	..	..	388	..
Chateaulin	85	..	..	..	303	..
Crotoy	261	..	..	..	240	..
Courseulles	1,221	..	..	..	..	..
Camaret	..	..	..	..	65	..
Carentan	947	..	..	..	1,435	..
Croisset	340	..	..	..	..	..
Cette	2,783	478	..	..	..	..
Coneron	1,376	190	..	..	946	..
Carteret	..	..	..	..	105	..
Dunkirk	68,238	6,031	2,140	4,184	6,716	..
Dieppe	86,109	45,104	..	..	73,934	5,401
Dives	148	..	..	..	..	..
Duclair	85	..	..	..	1,325	..
Dahouet	..	..	..	..	209	..
Douarnenez	..	..	..	..	408	..
Dulette	..	..	..	..	340	..
Etaples	..	118	..	..	..	..
Eu	2,363	..	..	..	444	..
Fecamp	15,537	600	..	1,440	12,250	1,326
Gravelines	15,974	100	..	..	153	257
Granville	3,996	..	..	..	3,093	1,301
Gironde	..	..	..	..	300	..
Hennebont	1,410	..	..	..	5,392	..
Harfleur	2,568	374	..	..	..	..
Honfleur	25,609	1,208	..	..	18,586	637
Havre	97,974	5,355	..	669	131,579	4,105
Isle D'Oleron	..	..	..	..	110	..
Isigny	1,045	140	..	..	4,886	..
La Flotte	..	..	..	..	426	..
Lannion	238	230	..	..	603	..
Libourne	1,887	..	..	..	..	..
L'Orient	2,943	..	..	58	1,342	55
Landerneau	380	..	..	..	2,512	..
La Rochelle	7,354	100	..	..	42,283	427
La Tremblade	166	..	..	..	791	..
La Vivier	233	..	..	..	..	..
La Questa	..	..	..	..	138	..
La Brault	..	..	..	..	475	..
Les Monnards	247	..	..	..	256	..
La Bouille	..	..	..	..	340	..
La Legue	..	..	..	..	374	..
Luc	324	..	..	..	..	..
Lucon	2,680	..	..	..	1,929	..
La Seyne	..	..	..	181	..	..
La Moule	2,585	..	..	..	..	..
Marans	1,470	..	..	..	1,485	150
Morlaix	2,189	..	..	..	1,933	..
Marseilles	12,841	623	..	790	23,982	849
Manbert	430	..	..	..	..	..
Mesquer	..	..	..	..	140	..
Morique	70	..	..	..	78	..
Marennes	71	..	..	..	1,545	..
Mortagne	954	..	..	..	545	..
Moscele Bay	..	..	50	..	..	..
Nantes	12,821	1,062	..	2,050	56,925	7,069
Paris	..	..	..	107	..	..
Paimpol	..	..	..	..	375	..
Paimboeuf	140	..	..	..	603	..
Pont L'Abbé	..	..	..	..	694	..
Port Vendres	170	..	..	..	..	..
Port-au-Bessin	2,537	..	..	..	4,460	..
Porquerolles	893	..	..	..	..	..
Pontrieux	130	265	..	..	250	..
Porule	540	..	..	..	406	..
Pouliguen	400	..	..	150	453	..
Pont-au-de-Mer	1,773	..	..	..	2,127	228
Point-aux-Herbes	215	..	..	..	4,796	..
Pont-du-Frine	150	..	..	..	..	..
Port Launnay	..	..	..	..	638	..
Pontorson	220	..	..	..	569	435
Port Louis	595	..	..	..	..	..
Perros	517	..	..	..	100	..
Quillebœuf	774	..	..	..	..	..
Quimper	120	..	..	..	928	..
Quiberon Bay	..	..	..	..	121	..
Riberon	320	..	..	..	208	..
Royan	577	..	..	..	255	..
Rochfort	2,120	..	..	..	9,591	991
Redon	450	..	..	..	1,100	..
Roche Bernard	450	..	..	..	..	..
Rouen	64,498	4,290	..	..	33,524	5,510

Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
FRANCE—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Regneville	353	..	..	..	10,817	..
Roscof	..	..	..	..	208	..
St. Nazaire	21,451	..	..	223	151,917	724
St. Valery	4,105	86	..	..	1,894	855
St. Valery-sur-Somme	8,837	..	..	..	..	145
St. Malo	25,812	1,236	..	302	51,385	3,086
St. Brieux	4,480	..	..	..	3,776	429
St. Gilles	318	..	..	..	537	..
St. Louis	..	..	..	..	360	..
St. Seurin d'Uset	150	..	..	..	..	..
St. Vaast	1,126	..	..	..	215	..
St. Servan	481	..	..	..	940	..
Setques	..	..	..	..	603	..
St. Raphael	150	..	..	..	..	..
Sables	..	..	..	..	933	..
Sables d'Olonne	1,605	..	..	..	2,564	..
Toulon	3,885	..	..	..	701	..
Treport	6,851	..	..	..	1,869	..
Trouville	17,140	..	..	..	19,396	..
Treguier	397	..	..	..	767	..
Vannes	966	..	..	..	558	..
Ville d'Eu	234	..	..	..	..	..
DENMARK.						
Assens	773	..	..	..	..	..
Allinge	..	150	..	..	..	..
Adlersborg	180	..	..	..	..	..
Aarhuus	9,279	550	..	..	132	14,434
Altona	17,424	..	..	..	..	..
Apenrade	300	..	..	..	..	..
Aalborg	6,346	1,113	..	..	1,398	3,174
Bogense	412	231	..	..	234	..
Blankenese	147	..	..	..	..	..
Bandholm	1,060	..	..	..	126	703
Bornholm	95	80	..	..	90	86
Brunsbuttel	100	..	..	..	..	..
Copenhagen	110,962	28,560	..	168	19,089	15,983
Cappeln	90	75	..	..	..	..
Catingsiel	102	..	..	..	..	..
Dragor	..	233	..	..	..	..
Delve	212	..	..	..	..	..
Eeroeskjobing	114	..	..	..	233	..
Elsinore	117,350	13,647	..	300	870	2,221
Ebeltoft	..	..	..	..	..	190
Eckenforde	1,199	761	..	..	..	990
Elmshorn	800	..	..	..	..	..
Eider	223	..	..	..	..	168
Excrombrera	904	..	..	..	..	..
Flensborg	8,604	2,283	..	..	3,033	5,964
Frederiksund	723	..	..	..	..	..
Frederikshaven	2,251	..	..	..	..	1,629
Frederichstadt	1,242	60	..	..	60	1,977
Fredericia	1,243	215	..	..	627	2,396
Fasborg	552	..	..	..	578	881
Fehmern	1,683	..	..	..	..	124
Fohr	258	..	..	..	..	..
Faroe	318	..	..	..	446	346
Fanoe	180	87	..	..	56	..
Frederichsvœrk	946	110	..	..	..	265
Garrucha	671	..	..	..	..	..
Gluckstadt	20,739	..	..	..	..	..
Greunsae	..	..	..	..	..	70
Helingenhafen	544	146	..	..	..	..
Husum	742	..	..	..	..	17
Hadersleben	1,327	..	..	..	132	65
Horsens	2,594	727	..	..	318	5,484
Holbeck	1,417	208	..	..	190	1,668
Hobroe	1,021	..	..	..	196	362
Hielsminde	..	..	..	..	629	34
Holnis	..	..	..	..	1,136	728
Howacht	318	..	..	..	180	262
Heppens	3,343	..	..	..	..	..
Hoyer	370	..	..	..	64	..
Itzehoe	2,473	..	..	..	..	..
Krik	42	..	..	..	..	..
Kiel	22,874	2,994	..	..	6,467	4,987
Kastrup	3,230	160	..	..	265	422
Kjoge	2,103	172	..	..	388	311
Kolding	875	21	..	..	214	1,059
Kongelf	..	..	..	..	..	336
Kjertiminde	215	113	..	..	..	316
Karrebechsminde	698	..	..	..	..	207
Korsoer	15,083	1,363	..	..	1,300	4,969
Kallundborg	834	..	..	..	1,239	..
Logstor	499	126	..	..	..	92
Lonstrup	127	..	..	..	..	..
Lokken	249	45	..	..	..	204
Lemvig	94	..	..	..	..	..
Mariager	340	..	..	..	..	..
Meldorf	601	..	..	..	..	..
Middelfart	74	..	..	..	79	604
Mullerup	..	..	..	..	..	682
Nibe	193	..	..	..	..	145
Nivaa Bay	446	230	..	..	..	1,106
Nordberg	227	..	..	..	234	..
Nexœ	150	..	..	..	..	..
Nakskov	1,252	355	..	..	..	2,115
Nyborg	2,488	752	..	..	813	313
Nyekjobing	2,787	170	..	..	106	765
Neatvedt	910	60	..	..	..	139
Neufeldt	445	..	..	..	..	..
Nystedt	207	141	..	..	..	..
Nymin-de-gal	210	..	..	..	..	..
Odense	5,219	818	..	..	799	5,185
Pelworm	86	..	..	..	..	..
Pahlhude	160	..	..	..	..	156
Praestœ	583	..	..	..	..	894
Randus	6,140	216	..	..	89	3,396
Ronne	249	..	..	..	..	462
Roeskilde	1,838	..	..	..	..	773

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Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
DENMARK—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Rorvig	..	127	..	..	..	..
Rendsborg	2,753	..	..	..	..	745
Ribe	222	..	..	..	..	..
Rinkjobing	112	..	..	..	..	..
Rudkjobing	791	1,349	..	..	208	353
Rosingard	109	..	..	..	..	..
Rodvighaven	857	..	..	..	..	..
Samsoe	94	98	..	..	..	..
Stubbekjobing	479	60	..	..	100	..
Schlesvig	1,013	..	..	..	119	974
Soevig	..	..	..	..	..	318
Sonderborg	1,450	325	..	..	149	502
Svendborg	2,430	109	..	..	1,645	282
Stege	356	..	..	..	..	669
Skjelsker	253	231	..	..	120	326
Struer	58	..	..	..	..	111
Svanike	213	..	..	..	..	..
Skodsborg	253	..	..	..	..	..
Skive	518	230	..	..	..	..
Saxjobing	356	..	..	..	300	..
Sylt	138	..	..	..	..	..
Thisted	1,726	159	..	..	..	310
Todendorf	180	..	..	..	..	..
Tonning	13,131	..	..	..	..	..
Tomby	43	..	..	..	..	..
Utersen	2,006	..	..	..	..	838
Wordingborg	1,161	107	..	..	..	312
Weile	1,647	127	..	..	235	2,366
Wyckauf Fohr	144	..	..	..	..	..
Warde	32	..	..	..	..	..
Worden	100	..	..	..	..	..
Wohrden	234	..	..	..	..	..
Wornerhafen	148	..	..	..	..	..
NORWAY.						
Alten	1,383	..	..	..	..	..
Arendahl	1,290	681	..	..	..	228
Aalesund	509	..	..	..	..	336
Bergen	17,513	962	..	..	3,527	3,025
Bodoe	2,570	..	..	..	..	203
Brevig	150	134	..	..	188	..
Christiansand	6,018	164	..	..	..	4,117
Christiansund	497	..	..	30	..	..
Christiania	22,076	5,463	..	..	2,373	26,868
Drontheim	8,217	..	..	..	..	1,895
Drammen	3,117	382	..	..	223	1,796
Droback	..	85	..	..	..	..
Dram	..	..	..	..	..	3,363
Egersund	913	80	..	..	191	..
Flekkefiord	120	..	..	..	..	..
Fredericksvern	808	..	..	..	..	..
Fredrickshald	1,144	..	..	..	..	1,935
Farsund	..	20	..	..	..	83
Grimstadt	..	80	..	..	..	..
Holmstrandt	315	..	..	..	..	455
Holmstadt	166	..	..	..	..	..
Hangesund	207	410	..	..	380	..
Hammerfest	2,552	..	..	30	1,001	..
Horten	2,142	..	..	..	..	..
Jessefjord	103	..	..	..	..	..
Krageroe	1,350	517	..	..	115	..
Kjollefford	164	..	..	..	..	..
Krantsand	5,734	..	..	..	..	..
Laurvig	521	448	..	..	..	505
Langesund	180	..	..	..	..	215
Lillesand	21	..	..	..	..	..
Mo	67	..	..	..	..	..
Moss	487	150	..	..	..	411
Mandhal	494	200	..	..	..	1,240
Molde	164	..	..	..	..	..
Namsos	254	..	..	..	..	..
Oster Risoer	22	..	..	..	..	..
Poragrund	1,179	1,915	..	..	..	..
Rusoer	96	..	..	..	..	98
Saltbek Bay	660	..	..	..	..	..
Sandifjord	765	..	..	..	..	477
Stavanger	1,274	141	..	..	284	1,821
Solstandstrom	318	..	..	..	..	..
Skien	230	152	..	..	..	..
Sande	..	..	..	..	..	310
Soon	130	..	..	..	..	..
Sonsberg	766	120	..	..	248	911
Tromsoe	1,950	..	..	..	..	2,792
Tvedestrande	211	534	..	..	..	..
Vigsnaes	302	..	..	..	..	..
Vardo	384	..	..	..	..	..
Wadsoe	898	..	..	..	..	210
Wardoe	..	..	..	..	..	658
SWEDEN.						
Ahus	1,288	393	..	..	..	652
Calmar	2,006	..	..	..	..	..
Carlscrona	3,223	..	..	..	..	..
Carlshamn	95	..	..	..	..	..
Cimbristhamn	725	..	..	..	..	..
Engelholm	490	..	..	..	..	93
Falkenborg	392	..	..	..	..	..
Gothenburg	78,883	6,721	130	..	471	4,278
Gefle	2,701	1,170	..	..	..	310
Gustafsborg	..	366	..	..	..	2,067
Getting	20	68	..	..	..	..
Gunnibo	561	..	..	..	..	..
Helmstadt	1,332	..	..	..	..	..
Holmstadt	101	..	..	..	..	..
Hernosand	167	..	..	..	..	..
Haparanda	475	..	..	..	..	..
Hudiksvall	339	..	..	..	..	..
Helsingborg	2,745	2,237	..	..	630	675
Kallerofjardin	776	..	..	..	..	..
Landscrona	12,135	279	..	..	718	448
Malmo	17,189	11,228	..	..	258	305
Monsteras	..	..	..	..	..	100
Nyhoping	667	..	..	..	..	..
Norkjobing	7,967	690	..	..	..	190

Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
SWEDEN—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Norkoping	..	..	..	..	..	303
Oscarhamn	217	710	..	..	733	336
Ronneby	..	500	..	..	..	..
Stora	920	..	..	..	..	..
Soderhamn	512	..	..	..	..	..
Stockholm	48,106	8,072	..	172	1,206	7,796
Sundsvall	221	..	..	..	..	..
Strandmollen	2,117	..	..	..	..	..
Solvitsburg	133	101	..	..	..	..
Stromshold	450	..	..	..	..	..
Stromstadt	..	30	..	..	..	..
Tindered	127	..	..	..	..	..
Trelleborg	2,503	123	..	..	..	..
Uddewalla	7,500	..	..	..	..	..
Westeras	231	170	..	..	..	168
Westerwich	225	871	..	..	173	..
Warberg	190	109	..	..	..	..
Wefelsfioth	70	..	..	..	..	..
Wisby	1,007	..	..	..	..	..
Ystadt	5,436	307	..	..	..	155
RUSSIA.						
Archangel	..	..	..	..	..	120
Abo	1,511	507	..	..	..	..
Bolderaa	1,091	..	..	..	335	..
Batoum	..	..	..	..	5,443	..
Cronstadt	284,054	46,316	..	251	14,074	10,674
Dago	240	..	..	..	..	..
Dahlsbruk	1,817	..	..	..	..	..
Fredericksharnn	98	..	..	..	..	..
Gamla	..	..	..	..	..	373
Helsingfors	3,832	25	..	..	..	..
Kertch	1,253	..	..	..	13,343	..
Libau	1,397	..	..	..	..	940
Narva	1,664	1,800	..	..	..	150
Nicolaeff	1,359	..	..	..	..	..
Nesseda	..	..	..	..	..	150
Odessa	48,039	500	..	2,533	35,412	16,916
Pornau	1,265	..	..	..	..	..
Petchora	450	..	..	..	..	..
Richjavich	496	..	..	..	..	..
Riga	34,675	576	..	..	1,142	6,110
Revel	1,667	..	..	..	..	706
St. Petersburgh	21,320	5,778	..	1,925	1,097	2,729
Sebastopol	904	..	..	..	2,553	..
Taganrog	850	50	..	..	3,855	..
Wiborg	260	1,033	..	..	110	..
Windau	389	91	..	..	..	287
Wasa	400	..	65	..	..	..
AUSTRIA.						
Bocchi de Cattaro	..	..	..	..	402	..
Fiume	988	..	..	..	..	..
Pola	..	..	..	..	709	..
Ragusa	..	..	..	..	485	..
Trieste	23,171	..	420	4,263	49,481	12,928
Venice	1,039	..	..	..	..	..
GERMANY.						
Besserup	100	..	..	..	..	538
Bremerhafen	3,023	149	..	..	..	407
Bremen	1,055	196	..	..	910	21
Brake	4,517	84	..	..	..	103
Brunshausen	2,842	273	..	..	..	..
Cuxhaven	12,271	..	..	..	..	..
Cranz	1,002	..	..	..	..	..
Carolinensyhl	391	..	..	..	..	..
Dornummersiel	110	..	..	..	..	..
Dombusch	1,381	..	..	..	..	..
Emden	684	..	..	..	..	207
Estebrugge	434	..	..	..	..	..
Freyburg	646	..	..	..	..	..
Fedderwardersiel	515	..	..	..	..	..
Greetsyhl	58	..	..	..	..	120
Geestemunde	5,839	..	..	..	..	..
Gaunsiech	3,612	..	..	..	..	..
Grohn	164	..	..	..	..	..
Hamburg	650,386	18,722	8	460	35,292	7,188
Harburg	7,235	70	..	..	..	472
Hooksiel	322	..	..	..	..	..
Leer	5,652	..	..	..	120	110
Lubeck	16,816	563	..	..	2,583	4,792
Mariensiel	1,615	..	..	..	..	..
Neustadt	929	147	..	..	2,077	788
Neuhaus	1,035	..	..	..	..	..
Norden	1,307	..	..	..	..	..
Oberndorf	2,288	..	..	..	..	..
Otterndorf	120	..	..	..	..	..
Pagensand	184	..	..	..	..	..
Rostock	6,476	..	..	..	2,201	12,196
Stade	5,939	64	..	..	8	259
Spiker-oge	66	..	..	..	..	..
Schwarzenhutten	465	..	..	..	..	..
Strouhausersiel	194	..	..	..	..	..
Steinhamersiel	1,583	..	..	..	..	..
Steinbruch	299	..	..	..	..	..
Vefsen	212	143	..	..	..	..
Vaiel	2,942	..	..	..	..	..
Vegesack	1,150	..	..	..	..	..
Weener	612	..	..	..	..	..
Wismar	12,935	593	..	..	..	4,111
Wischaven	4,888	..	..	..	..	..
Waddersell	127	..	..	..	..	..
PRUSSIA.						
Burg	205	..	..	..	..	..
Colberg	6,552	..	..	..	..	84
Dantzic	38,772	11,062	..	..	4,053	26,749
Fairwater	12,537	746	..	..	..	..
Greifswalde	2,748	300	..	..	..	610

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Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
PRUSSIA—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Konigsberg	6,633	620	..	..	245	2,779
Lissa	..	..	..	..	538	..
Memel	20,275	1,785	..	..	1,775	4,153
New Fairwater	19,784	1,575	..	..	680	922
Pillau	14,313	..	..	25	2,946	3,146
Rugenwalde	138	..	..	..	..	..
Stolpemunde	1,123	..	..	..	..	..
Stralsund	9,263	460	..	..	620	1,763
Stettin	70,528	10,563	..	59	1,773	12,247
Swinemunde	117,693	5,451	..	..	3,946	2,737
Wolgast	13,316	..	..	..	243	6,355
Wilhelmshafen	63	..	..	..	..	..
Uckermunde	328	..	..	..	..	..
HOLLAND.						
Amsterdam	999	958	..	..	..	532
Brouwershoven	646	..	..	..	..	..
Breskins	233	..	..	..	..	..
Dordrecht	..	..	..	..	..	325
Dordt	19,995	..	..	..	361	..
Delfshaven	297	..	..	..	..	..
Flushing	6,431	95	..	..	..	328
Groningen	8,231	336	..	..	260	..
Harlingen	4,825	..	..	..	..	944
Hellevoetsluys	600	..	..	..	..	..
Leeuwarden	2,444	..	..	..	..	..
Kampen	..	40	..	..	..	..
Lemmer	95	..	..	..	..	..
Middelburg	2,490	..	..	..	..	..
New Diep	100,699	20	..	..	..	..
Rotterdam	50,092	446	..	..	842	3,451
Schiedam	12,911	..	..	..	..	107
Vaardingen	70	..	..	..	..	..
Zierickzee	4,791	..	..	..	..	..
BELGIUM.						
Antwerp	6,552	11,855	52	..	4,112	1,862
Bruges	5,963	193	..	..	..	4,687
Brussels	30	..	..	..	..	..
Ghent	1,355	..	..	..	..	247
Ostend	45,945	..	..	..	..	3,100
Nieuport	615	..	..	..	..	..
Phillipeville	240	..	..	..	203	..
SPAIN.						
Alicante	4,039	..	..	562	20,822	..
Almeira	829	..	..	..	500	..
Adra	148	..	..	..	658	..
Alcudia	..	..	..	..	701	..
Barcelona	25,795	8,242	..	457	64,191	1,577
Bilboa	3,844	188	..	984	12,767	482
Carthagena	17,614	..	..	..	10,670	..
Cadiz	13,266	..	..	2,409	44,864	204
Corunna	1,886	..	..	..	2,539	..
Canil	..	..	..	..	500	..
Denia	..	..	..	..	743	..
Deva	130	..	..	..	..	..
Ferrol	2,641	..	..	150	3,012	..
Gijon	..	..	..	35	..	..
Granja	..	..	..	..	140	..
Huelva	385	..	..	265	2,809	2,281
Malaga	13,126	2,180	..	2,695	8,584	2,935
Metaro	514	..	..	..	3,758	..
Motril	4,545	..	..	..	150	..
Pola	..	..	..	..	555	..
Passages	1,050	..	..	..	1,774	..
Port Sul	..	..	..	..	72	..
Palamos	85	..	..	..	..	..
Palomar	106	..	..	..	..	..
Rosas	..	..	..	..	239	..
St. Carlos de Rapiter	.	..	..	..	1,044	..
San Felix de Quixols	329	..	..	..	185	..
Seville	654	539	..	2,486	13,356	526
Santander	7,771	..	..	5,270	8,686	..
San Sebastian	261	..	..	369	225	..
Torre-del-Mar	445	165	..	..	..	340
Tarragona	3,332	..	..	..	8,502	196
Valencia	4,148	..	..	301	2,286	202
Vigo	1,753	..	..	130	3,534	..
Villaricos	1,326	..	..	..	..	..
Villa Nueva	706	..	..	..	3,594	..
PORTUGAL.						
Aveiro	42	..	..	..	912	..
Caminha	269	..	..	..	..	..
Figueira	1,854	..	..	173	..	..
Lisbon	50,015	4,954	72	4,902	51,518	3,796
Oporto	11,378	..	2,090	950	434	540
Pomeran	140	..	..	3,158	470	..
St. Ubes	1,875	..	..	..	..	..
Viana	1,388	..	..	..	..	..
Villa de Conde	140	..	..	..	..	..
ITALY.						
Agasteria	3,266	..	..	..	..	..
Ancona	1,883	..	..	2,897	10,590	..
Baiæ	310	..	..	..	..	..
Brindisi	4,381	..	..	300	10,332	2,111
Bari	886	..	70	29	537	..
Barletta	434	..	..	..	..	..
Castellamare	1,474	..	..	..	1,575	..
Civita Vecchia	14,405	..	..	399	4,016	960
Genoa	116,690	3,516	..	23,419	91,811	39,308
Gaeta	..	..	..	..	491	..
Leghorn	22,587	..	..	5	9,697	765
Mentone	170	..	..	..	..	..
Monaco	1,903	..	..	..	..	..
Morletta	..	..	..	..	324	55

Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
ITALY—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Naples	40,014	1,239	..	1,802	29,475	13,274
Nice	6,131	..	..	..	870	..
Piombino	445	..	..	..	..	..
Port Maurice	..	..	..	..	960	..
Reggio	1,880	..	..	..	..	..
Rimini	550	..	..	..	..	..
Spezzia	..	..	..	467	..	..
Sinigaglia	..	..	..	..	50	..
Salerno	3,081	..	213	..	2,699	..
Taranto	..	..	..	..	1,017	..
Venice	38,547	..	70	582	33,233	1,092
MEDITERRANEAN SEA.						
Ajaccio	..	..	..	..	413	..
Anapolis	..	..	..	..	336	..
Bastia	536	..	..	..	1,911	..
Catania	2,978	..	..	..	948	..
Corfu	1,608	..	..	707	14,361	1,790
Cagliara	6,748	..	..	114	6,968	..
Gibraltar	22,510	100	..	6,438	84,570	3,248
Girgenti	1,320	..	..	..	285	..
Licata (Sicily)	1,068	..	..	..	..	322
Malta	19,047	2,213	42	7,888	88,184	5,254
Milazzo (Sicily)	463	..	..	194	..	..
Marsala	..	..	..	91	..	..
Messina	8,582	2,645	..	4,187	12,899	..
Palma (Majorca)	124	..	..	1,407	5,522	..
Palermo	22,479	500	..	370	13,689	1,959
Port Mahon	449	..	..	..	2,235	..
Syracuse	1,667	..	..	..	600	..
Trapani (Sicily)	1,114	..	..	..	198	..
Zaphran Isles	594	..	..	..	..	..
Zante	..	..	..	..	3,342	600
GREECE.						
Athens	3,152	..	..	322	1,575	..
Carlo Forte	..	..	..	..	2,690	..
Chalchis	493	..	..	..	..	..
Patras	653	..	..	..	1,051	..
Piræus	..	..	..	..	394	..
Spezzia	3,796	..	..	..	2,372	..
Syra	773	..	231	426	16,033	..
TURKEY.						
Alexandretta	1,527	..	..	..	719	..
Bussorah	481	..	..	..	2,270	..
Beyrout	622	..	..	..	6,572	..
Canea	..	..	40	..	..	..
Constantinople	77,683	182	..	5,507	36,732	12,153
Galatz	21,851	950	..	1,634	16,706	2,515
Halvali	..	..	..	40	..	..
Ibrail	..	..	..	538	..	..
Kustendji	504	2,835	..	951	2,223	..
Mersyne	365	..	..	..	..	..
Ragusa	..	..	..	..	2,907	..
Rhodes	..	..	..	..	323	..
Smyrna	8,377	..	..	8	23,668	418
Salonica	3,249	..	..	195	2,266	..
Sulina	3,065	..	..	500	5,402	..
Savona	10,282	465	..	795	..	1,599
Trebisonde	..	..	..	..	2,865	..
Varna	..	1,600	..	..	..	..
AFRICA	..	..	..	334	..	..
Acassa	..	..	..	150	..	..
Algiers	7,520	..	..	149	12,856	621
Alexandria	182,188	15,097	1,160	16,331	69,307	24,161
Algoa Bay	300	..	469	567	..	..
Algeria	..	..	..	..	200	..
Bathurst (R. Gam.)	..	..	42	..	..	..
Banana Islands	..	..	..	775	..	..
Benin	..	..	..	20	..	..
Bona	268	..	..	..	3,226	..
Bonny	..	..	..	174	..	..
Cape Town	1,534	..	192	351	1,679	..
Cape of Good Hope	4,567	..	1,670	50	11,762	..
Cape de Verds	2,152	..	..	..	36,848	..
Chafarnias	..	..	..	..	359	..
Congo	..	..	..	185	291	..
Dakar	..	..	..	..	5,971	..
Fernando Po	..	..	..	..	720	..
Goree	..	..	..	15	..	..
Lagos	..	..	..	343	..	..
Jellia Coffee	..	..	..	68	1,469	..
Mers-el-Kebin	..	..	..	58	..	..
Mozambique	..	..	..	..	539	..
Oran	3,491	..	..	..	5,971	..
Old Calabar	..	..	..	567	..	..
Port Said (Egypt)	8,927	25,167	..	8,095	88,417	1,710
Porte Grande	546	..	..	..	..	..
Port Elizabeth	333	..	..	..	..	..
Port Alfred	..	..	43	..	..	..
Port Natal	..	..	260	..	..	..
Storah	540	..	..	..	..	..
St. Plo. de Loando	..	..	..	201	800	189
Sierra Leone	..	..	..	753	667	..
St. Nicholas, Cape Verd Islands	..	..	96	..	..	..
St. Vincent, Cape Verd Islands	763	..	56	..	..	..
Teuez	..	..	..	..	193	..
Table Bay	511	..	..	..	3,566	..
Tunis	303	..	..	..	4,185	..
Tangier	300	..	..	..	145	..
Zanzibar	..	..	..	..	2,260	..
AUSTRALIA	..	..	100	..	..	..
Adelaide	140	..	1,313	..	..	..
Brisbane	..	..	70	..	..	..

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Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
AUSTRALIA—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
ng George's Sound	1,887	..	..	3,314	1,592	..
elbourne	..	..	..	240	..	237
Port Torres	1,989	..	..	..	720	..
Swan River	..	..	213	..	..	..
Sydney	..	..	100	..	..	..
Wellington	..	..	386	..	..	..
EAST INDIES.						
Anjer	901	..	..	..	1,151	..
Aden	11,423	..	1,689	18,784	29,599	..
Bassilau	..	..	..	..	617	..
Bombay	42,462	..	2,821	137,162	11,808	21,044
Bang-Koh	795	..	310	..	..	..
Batavia	6,015	..	..	1,093	1,900	..
Bassein	900	..	..	1,359	550	..
Bushire (in Persia)	2,350	..	1,110	..	860	792
Beypoor	1,404	..	..	..	..	..
Cochin	..	..	..	..	694	..
Colombo	540	..	492	..	..	..
Calcutta	17,061	..	1,607	1,994	10,802	4,292
Ceylon	763	..	754	..	..	..
Cheefoo	678	..	..	..	1,992	..
Coconada	2,036	..	..	..	1,731	1,159
Java	1,511	..	50	..	..	..
Japan	1,931	..	2,486	215	1,060	..
Hong Kong	4,636	..	1,062	4,254	45,169	574
Kurrachee	..	..	..	264	..	..
Kanagawa	160	..	105	..	..	..
Mangalore	..	..	200	..	..	..
Madras	3,835	..	775	510	763	535
Mauritius	2,395	..	150	696	10,116	3,464
Manilla	1,431	..	110	1,757	10,227	..
Muscat	3,710	..	..	..	..	..
Negapatam	673	..	..	..	..	..
Nagasaki	640	..	..	155	757	..
Osaka (Japan)	..	..	..	..	267	..
Penang	..	..	1,548	..	..	252
Phillipine Islands	..	..	..	..	640	..
Pt. de Galle (Ceylon)	23,299	..	1,750	2,963	20,850	..
Port Blair	1,650	..	..	..	1,014	..
Rangoon	6,427	3,227	1,421	1,520	4,146	900
Sourabaya	7,846	..	..	..	..	..
Singapore	25,238	..	2,615	8,642	42,349	1,330
Shanghae	13,870	..	1,614	2,860	21,704	..
Seychelle Island	..	..	..	..	1,211	..
Tien-tsin	..	..	95	..	..	..
Yokohamo	2,008	..	310	5,110	24,958	..
WEST INDIES.						
Antigua	477	140	295	917	..	..
Barbadoes	1,553	..	622	20	4,701	1,878
Blize	567	..	70	20	..	..
Bermuda	4,104	..	38	340	3,688	..
Cardenas	861	..	..	4,255	3,733	8,915
Cuba	..	606	320	874	450	11,044
Cienfuegos (Cuba)	161	..	..	3,170	..	1,343
Colon	..	..	..	20	4,604	310
Dominica	..	..	91	..	..	..
Grenada	..	..	137	..	3,852	..
Guadaloupe	11,728	398	..	..	230	..
Havannah (Cuba)	14,338	3,300	..	30,469	97,091	12,042
Hayti	..	..	..	..	499	323
Jamaica	1,346	..	589	1,228	37,106	146
Kingston	..	..	..	437	1,048	..
Le Moule (Guad.)	265	..	..	..	..	..
Martinique	7,643	..	280	..	21,866	..
Matanzas (Cuba)	..	..	..	3,910	4,580	25,695
Monterrat	..	..	..	..	558	..
Marie Galante	1,834	..	..	..	..	..
Nassau (N.P.)	429	..	..	..	1,675	..
Neuritas (Cuba)	..	..	..	..	341	..
Porto Rico	261	..	30	796	3,604	409
Port Royal (Jam.)	615	..	..	..	803	..
Port au Prince	..	..	..	1,456	986	..
St. Thomas	2,058	150	206	2,054	44,712	150
Sague la Grande	570	..	..	577	530	..
St. Lucia	..	..	38	18	1,933	..
St. Vincent	..	..	226	50	..	..
St. Jago-de-Cuba	2,210	980	..	1,280	4,546	2,070
St. Pierre (Martq.)	..	..	..	100	..	..
St. Kitts	..	..	725	..	..	..
St. François (Guad.)	448	..	..	..	..	..
Sombrero	..	..	46	..	170	..
Santiago	..	..	..	..	789	..
St. Martins	..	..	..	170	671	..
Trinidad	212	..	597	573	..	3,661
Tobago	..	..	154	128	..	127
Trinidad de Cuba	914	..	..	2,815	5,229	290
Zaza (Cuba)	..	..	..	360	..	..
NORTH AMERICA.						
Adrian	..	..	..	..	30	..
Boston	8,238	..	..	5,854	..	334
Bathurst, N.B.	..	..	..	220	..	..
Belize	..	..	..	108	..	..
Bridgeport	362	..	..	..	..	..
Chaleur Bay	..	..	..	8	..	..
Charlotte Town	..	..	..	76	553	..
Charleston	..	..	..	231	..	..
Digby, N.S.	..	..	..	..	..	180
Dalhousie, N.B.	..	..	..	35	..	..
East London	..	..	60	..	..	..
Guaymas (Mexico)	..	..	200	..	..	..
Geneava	..	..	..	..	..	315
Galveston	..	..	..	129	..	..
Hudson's Bay	..	..	63	..	..	..
Halifax, N.S.	766	..	..	243	8,105	..
Harbor Grace	..	..	..	551	1,350	..
Mazatlan (Mexico)	..	..	..	462	..	..
Maine, U.S.	..	..	..	175	..	..
Lymford	162	..	..	..	..	..
Labrador	..	466	..	19	..	..

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NORTH AMERICA—*cont.*	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Liverpool, N.S.	..	..	..	..	426	..
Miramichi	..	..	..	60	..	..
Montreal	..	..	28	1,106	3,543	1,599
Newfoundland	..	200	200	..	380	1,427
New Orleans	..	..	..	40	..	..
New York	10,083	..	..	17,812	1,102	914
Newhaven, U.S.	5,641	..	..	2,588	..	..
New London, U.S.	1,004	..	..	..	..	..
Norfolk	..	..	..	298	..	..
Prince Edward Island	..	..	..	25	60	..
Philadelphia	1,164	..	..	..	..	..
Portland, U.S.	1,208	..	..	..	..	..
Providence, U.S.	1,829	..	..	..	..	..
Quebec	26,154	10,164	..	2,571	28,659	57,663
Richibucto	..	..	..	21	..	80
St. John's, N.F.	599	..	..	1,274	4,017	1,845
St. John's, N.B.	1,880	..	..	3,169	..	4,561
St. Andrew	..	..	..	..	..	131
St. Catherine's	480	..	..	..	7,777	..
St. Stephens	..	..	..	82	..	..
Savannah	..	..	..	2,669	..	455
Salem, U.S.	1,733	72	..	454	..	..
Summerside, P. E. I.	..	..	..	25	..	..
San Francisco	2,264	..	..	8,025	800	1,529
Shippegan	..	..	..	106	..	..
St. George	..	..	..	..	600	..
Tampico	..	..	..	20	..	..
Three Rivers	352	..	..	..	..	..
Toronto	..	..	..	..	..	100
Vancouver's Island	..	..	25	..	..	..
Yarmouth, N.S.	..	..	..	..	..	666
SOUTH AMERICA.						
Arica	..	..	..	334	..	..
Aspinwall	..	..	..	67	2,266	..
Berbice	..	..	1,519	..	..	551
Bahia	5,544	561	..	4,232	24,223	2,220
Buenos Ayres	1,068	..	2,019	25,381	31,202	3,066
Caldera	430	..	..	148	3,154	496
Callao	12,594	..	860	7,138	15,804	..
Cape Frio	..	..	..	..	356	..
Ceara	864	..	..	1,360	..	..
Canizal	..	..	..	586	250	..
Curaçoa	..	..	..	1,865	..	..
Coquimbo	2,979	..	..	50	6,255	..
Demerara	3,045	..	4,225	3,551	7,069	18,484
Fray Bentos	..	..	..	..	1,814	..
Guayaquil	..	..	..	55	..	..
Islay	..	..	..	20	1,650	..
Iquique	3,005	..	..	3,762	..	..
Lima	..	..	..	117	..	..
La Guayra	..	..	..	201	..	..
Maranham	..	..	..	2,500	10,051	..
Monte Video	4,636	..	1,242	9,766	139,393	5,070
Maroim	..	..	..	..	..	107
Mollenda, Peru	..	..	..	185	144	..
Natal	..	..	229	422	..	..
Nickerie	..	..	49	751	..	..
Panama	..	..	..	..	366	..
Para	1,552	..	..	1,524	5,252	..
Porto Alegre	..	..	..	73	..	..
Payta	..	..	..	..	809	..
Pernambuco	918	306	434	6,786	13,446	1,280
Puerto Cabello	..	..	..	2	122	..
Paraiba	..	..	..	305	..	..
Punto Arenas	..	..	22	..	..	..
Paramariba	504	..	105	547	280	1,284
Quimper	..	..	..	..	100	..
Rio Grande de Sul	..	174	75	..	..	73
Rio Grande	75	..	40	354	4,025	..
Rio Janeiro	24,486	..	100	22,091	68,463	783
Rosario	..	..	100	701	1,588	..
Surinam	..	..	..	173	100	..
Santa Catherine	231	..	..	..	..	..
Santos	514	..	129	548	3,007	60
Santa Cruz	186	..	..	..	..	..
S. Juan d' Los Remedios	..	..	..	..	831	..
Tocofilla	..	..	..	..	3,094	..
Torre de Mar	..	..	..	139	..	..
Tobago	..	..	5	..	..	..
Valparaiso	1,125	..	175	13,342	52,141	1,035
Vera Cruz	382	..	57	..	..	..
Waux River	..	..	12	..	..	..
CHANNEL ISLANDS.						
Alderney	1,209	..	..	..	..	..
Guernsey	22,693	594	..	..	690	..
Jersey	38,895	1,429	..	255	4,706	962
ICELAND.						
Bernfjord	11	..	..	5	..	158
Orebuk	87	..	..	..	..	..
AZORES.						
Fayal	..	..	..	142	2,076	..
Horto	197	..	..	..	..	..
St. Michaels	191	..	25	..	131	..
CANARIES	..	..	1,493	..	..	..
Teneriffe	1,064	..	..	..	6,525	..
MADEIRA	1,719	..	100	7	18,703	..
ASCENSION ISLANDS	..	..	..	..	2,015	..

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Name of Country and Port to which exported.	Northern Ports.	Yorkshire Ports.	London.	Lancashire.	Severn Ports.	Scotch Ports.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
ST. HELENA -	299	..	105	..	518	..
FALKLAND ISLANDS - -	..	..	357	..	423	..
NEW ZEALAND -	..	..	685	..	..	..
Auckland - -	250	..	..	60	..	..
Otago - - -	..	..	..	383	..	..
SANDWICH ISLANDS.						
Honolulu - -	..	..	..	100	..	..

Total exports from January 1869 to December 1869 inclusive - Tons. 9,775,470

General Summary for 1869 and 1870.*

——	1869.	1870.
	Tons.	Tons.
France - -	1,950,046	2,022,888
Denmark - -	627,536	721,973
Norway - -	165,912	201,505
Sweden - -	261,129	370,294
Russia - - -	587,761	761,781
Austria - - -	39,946	80,707
Germany - -	861,406	885,927
Prussia - - -	445,327	467,802
Holland - -	224,894	402,110
Belgium - -	87,121	122,030
Spain - - -	372,877	445,474
Portugal - -	140,170	174,090
Italy - - -	549,127	629,906
Mediterranean -	368,710	449,995
Greece - - -	33,937	42,953
Turkey - - -	313,962	295,446
Africa - - -	564,648	460,961
Australia - -	12,201	12,834
East Indies - -	692,356	623,046
West Indies - -	436,942	387,502
North America -	253,754	312,592
South America -	627,009	650,946
Channel Islands -	66,331	74,372
Heligoland - -	—	—
Iceland - - -	261	687
Azores - - -	2,762	3,509
Canaries - - -	9,102	12,141
Madeira - -	20,529	20,464
Ascension - -	2,015	1,611
St. Helena - -	922	63
Falkland Islands -	779	385
New Zealand -	1,378	273
Sandwich Islands -	100	164
Total - -	9,775,470	10,635,449

* It has not been possible to prepare for 1870 a detailed table of exports as for 1869 and the previous years.

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APPENDIX, TABLE No. 128.

COAL used in the MINES of CORNWALL and DEVONSHIRE, from which returns have been received, or to which the railways, making returns, have carried coal.

T signifies	Tin.	Z signifies	Zinc.
C „	Copper.	M „	Manganese.
L „	Lead.	W „	Wolfram.
S L „	Silver Lead.		

CORNISH MINES making Returns of COAL used in the Steam Engines and for other purposes in the Mines.

WESTERN DISTRICT.

No. of Mines making Returns.	Name of Mine.	Ore raised.	Coal used for Engines.	No. of Engines.	Actual Horse Power returned.	Coal used for other Purposes.	Description of Coal.
			Tons.			Tons.	
1	Balleswidden	T.	2,100	5	..	366	Neath.
2	Boscaswell	T. & C.	636	3	170	25	Main Colliery.
3	Boswedden and Wheal Castle	T.	556	2	..	36	
4	Botallack	T. & C.	3,725	12	665	168	Neath.
5	Cape Cornwall	T.	240	2	40	10	Welsh Mine.
6	Ding-Dong	T.	1,350	5	237	50	Common Welsh.
7	Garden	T.	60	1	..	15	Cardiff.
8	Huel Kitty, Lelant	T.	965	3	100	72	Welsh Mine.
9	Levant	T. & C.	1,396	4	..	283	Welsh Mine.
10	North Levant	T.	400	2	..	36	Main Colliery.
11	Huel Margaret	T.	100	4	120	29	Main Colliery.
12	Huel Margery	T. & C.	1,192	2	..	..	Welsh Mine.
13	Huel Mary	T.	780	3	230	70	Cardiff.
14	Huel Owles	T.	1,887	9	160	94	Main Colliery.
15	Pendeen Consols	T.	840	2	..	130	Main Colliery.
16	Prosper United	T.	4,614	7	413	250	Welsh Main.
17	Providence, East	T.	440	2	23	36	Main.
18	Providence Mines	T.	1,596	3	..	..	Welsh Mine.
19	Rosewall Hill	T.	730	3	118	100	Welsh Mine.
20	Saint Ives Consols	T.	2,349	5	189	100	Main Colliery.
21	Spearne Consols	T.	288	2	..	72	Main Colliery.
22	Spearne Moor	T. & C.	311	1	..	113	Main Colliery.
23	Trelyon Consols	T.	514	1	..	..	Welsh Mine.
	Total		25,719	78	2,465	2,005	
	13 mines from which returns are not received (estimated)	..	1,500	..	..	260	
	Total		27,219	..	..	2,265	
	Used for engines	..	27,219				
	Used for mine, &c.	..	2,265				
	Total in Western District	..	29,448				

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Appendix, Table No. 129.

West Central District.

No. of Mines making Returns.	Name of Mine.	Kind of Ore raised.	Coal used for Engines.	No. of Engines.	Actual Horse Power returned.	Coal used for other Purposes.	Description of Coal.
			Tons.			Tons.	
1	Huel Agar, East	C.	140	..	..	15	
2	Huel Baddern, Great	T. & L.	1,012	*	..	..	
3	Huel Basset	C.	1,922	*	..	..	
4	Huel Basset, North	C.	759	*	..	..	
5	Huel Basset, South	C.	540	*	..	..	
6	Huel Basset, West	T. & C.	2,249	4	..	122	Welsh Mine.
7	Huel Basset, East	C.	505	*	..	..	
8	Huel Buller	C.	1,725	*	..	..	
9	Huel Buller, East	C.	204	*	..	..	
10	Cargoll	S.L. & Z.	2,450	2	103	50	South Wales.
11	Carn Brea	C. & T.	6,200	14	650	670	Welsh coal.
12	Carn Brea, East	C.	1,504	*	..	..	
13	Carn Brea, South	T. & C.	1,125	*	..	..	
14	Carn Camborne	T. & C.	256	..	..	20	Main coal.
15	Chiverton	L.	..	..	..	..	
16	Chiverton, East	L.	192	..	..	..	
17	Chiverton, New	L.	360	..	..	60	
18	Chiverton, North	L.	..	..	..	..	
19	Chiverton, Great, South	L.	610	..	22	50	Cardiff.
20	Chiverton, West	L. C. & T.	..	..	..	..	
21	Clifford Amalgamated	C.	17,513	*	..	..	
22	Clijah and Wentworth	T. & C.	396	*	..	..	
23	Clifford New Huel	T. & C.	140	*	..	..	
24	Clifford, West	..	371	*	..	..	
25	Condurrow, South	T. & C.	..	..	..	..	
26	Cook's Kitchen	T & C.	2,380	4	110	500	Welsh Mine.
27	Copper Hill	C.	414	*	..	..	
28	Creegbraws	T. & C.	484	*	..	..	
29	Crofty, North Huel	C.	600	..	..	100	
30	Crofty, South Huel	T. & C.	600	3	120	100	Welsh coal.
31	Damsel, West Huel	T.	798	2	50	132	Mine coal.
32	Dolcoath	T. & C.	5,832	..	900	860	Cardiff coal.
33	Downs, Great, North	C.	1,791	4	800	30	South Wales.
34	Downs, North	C.	..	..	..	..	
35	Emily Henrietta	C.	700	1	80	20	Welsh Steam.
36	Falmouth and Sperries	T. & C.	1,663	*	..	..	
37	Frances, South Huel	T. & C.	1,213	*	384	252	Bituminous.
38	Frances, North	C.	121	..	..	..	
39	Frances, West Huel	T. & C.	1,212	..	..	77	
40	Godolphin, West	T.	..	..	..	12½	Welsh Mine.
41	Grambler, North Huel	T. & C.	..	..	..	..	
42	Grambler and St. Aubyn	T. & C.	166	..	..	..	
43	Grenville, East Huel	C.	1,017	1	200	..	Main coal.
44	Grenville, Huel	C.	1,929	3	275	..	Main coal.
45	Grenville, South	C.	147	1	58	..	Main coal.
46	St. George, West, Great	C.	704	2	..	96	
47	Great Work	T. & C.	..	..	..	..	
48	Great Work, West	T. & C.	360	1	90	70	
49	Great Work, East	T. & C.	..	..	..	..	Main coal.
50	Hallenbeagle	..	1,660	..	..	129	
51	Jane, Huel	L.	1,920	3	94	264	Cardiff.
52	Jane, North	T. & L.	435	..	..	..	
53	Kitty, Huel, St. Agnes	T.	1,368	..	..	107	Cardiff.
54	Leeds and St. Aubyn	T.	732	1	100	40	Powell's Duffryn.
55	Lovell, East Huel	T.	389	1	..	40	Cardiff.
56	Lovell, East, Great	T.	..	..	..	..	
57	Lovell, New Huel	T.	196	1	26	16	Common engine coal.
58	Mellanear	C.	..	..	..	..	
59	Nangiles	C.	1,400	2	90	66	
60	Pednandrea	T.	3,772	3	450	149	Welsh coal.
61	Pendarves United	T. & C.	3,711	4	237	365	Main coal.
62	Penhale, Huel Vor	T.	..	..	..	..	
63	Penhalls	T.	887	..	..	96	Main coal.
64	Pennance	C.	100	1	36	12	Welsh.
65	Polberro Consols	T.†	2,058	3	250	72	Welsh.
66	Polbreen	T.†	299	..	..	..	
67	Pool, East	T.C. & W.	965	4	301	1,289	Welsh Mine.
68	Rettallack, Great	L. & Z.	444	1	143	..	Welsh Mine.
69	Rose, Huel ‡	C.	1,804	..	..	180	
70	Rose, Huel, East	L.	..	..	..	..	
71	Roskear, North	T. & C.	..	..	..	..	
72	Rosewarne, Consols	C.	..	..	..	..	
73	Rosewarne, East	T. & C.	1,010	..	100	40	Mine coal.
74	Seton, Huel	C.	1,883	3	..	278	Common mining.
75	St. Day United	T. & C.	2,859	..	..	..	
76	Sparnon Huel	T. & C.	600	1	300	9	Welsh mine.
77	Stray Park	T. & C.	..	..	..	..	
78	Tincroft	T. & C.	3,780	..	341	719	Swansea mining coal.
79	Tolgus, West	C.	1,948	2	228	84	Welsh coal.
80	Tolgus, East	C.	157	..	..	..	
81	Tolgus, South	C.	1,768	..	..	..	
82	Treskerby, North	T. & C.	1,620	2	184	180	Cardiff and mine.
83	Treworlis	T.	597	1	..	65	Cardiff and common.
84	Trumpet Consols	T.	1,474	5	..	130	Cardiff and common engine.
85	Trumpet, East Mine	T.	119	1	..	10	
86	Union, Huel	..	57	..	..	..	
87	Uny, Huel	T. & C.	2,367	..	..	..	
88	Vor, Great Huel	T.	4,245	6	739	224	Cardiff.
89	Western Mines, Great §	T.	1,325	2	104	80	Steam coal.
	Total		109,294	85	7,465	6,780½	

* The returns given to the mines marked * are the quantities given by the railway supplying the mines with coal. It is not possible, therefore, to separate the coal used for producing steam power from the coal used for other purposes. Several of the mines receive a portion of their coal from other sources. This is accounted for in the final estimate.

† Polberro:—1865—2,308 tons.
1866—1,809 „
Polbreen:—1865—272 „
1866—327 „

‡ Coals consumed at Wheal Rose St. Agnes during 1865 and 1866.

	1865	1866
70-inch pumping engine	1,122 tons.	1,575 tons.
24-inch winding and crushing engine	300 „	278 „
Smith shop, dry, &c. &c.	125 „	132 „
	1,547 „	1,985 „

§ The Great Western Mines comprehend St. Aubyn and Grylls, East Huel Grylls late Greenberry Moor, Huel Wellington, the Georgia Florence and Grylls, West Huel Grylls, and Huel Grylls.

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West Central District—*continued.*	Coal used for Engines.	Coal used for other Purposes.
	Tons.	Tons.
46 mines from which returns were not received, estimated -	50,250	3,450½
Total - - - -	159,554	10,281
Used for engines - - - - - - - - - -	159,554	..
Used for mine, &c. - - - - - - - - -	10,231	..
Total in West Central District - - - - - - -	169,785	..

APPENDIX, TABLE No. 130.

EAST CENTRAL DISTRICT.

No. of Mines making Returns.	Name of Mine.	Kind of Ore raised.	Coal used for Engines.	No. of Engines returned.	Actual Horse Power returned.	Coal used for other Purposes.	Description of Coal.
			Tons.			Tons.	
1	Charlestown, United - -	T.	2,300	4	370	55	Welsh steam.
2	Crow Hill, New - - -	L.	1,000	2	104	..	Welsh.
3	Cuddra - - - -	T. & C.	1,292	3	190	48	Mining.
4	Eliza, Huel, Consols - - -	T. & C.	2,000	..	290	30	Stewart's Welsh.
5	Fowey Consols, South - -	C.	..	..	..	6	House.
6	Maudlin Mines - - -	T. & C.	20	1	90	4	Welsh.
7	Mulberry - - - -	T.	600	1	64	..	Steam.
8	Pembroke, New - - -	T. & C.	976	2	50	10	Mining coal.
9	Polgooth, Great - - -	T.	1,000	..	..	..	
10	Treleather, North - - -	L. & C.	..	..	..	..	
	Total - - -		9,188	16	1,158	153	

South Central District.	Coal used for Engines.	Coal used for other Purposes.
	Tons.	Tons.
15 mines from which returns were not received, estimated -	3,750	150
Total - - - -	12,938	308
Used for engines - - - - - - - - -	12,938	..
Used for mine, &c. - - - - - - - - -	308	..
Total in East Central District - - - - - - -	13,241	..

APPENDIX, TABLE No. 131.

EASTERN DISTRICT.

No. of Mines making Returns.	Name of Mine.	Kind of Ore raised.	Coal used for Engines.	No. of Engines returned.	Actual Horse Power returned.	Coal used for other Purposes.	Description of Coal.
			Tons.			Tons.	
1	Agar, East Huel - - -	T.	104	..	56	12	Steam.
2	Colquite and Callington -	C.	..	..	..	..	
3	Calstock Consols - - -	T.	..	..	..	12	Welsh.
4	Caradon Consols, Glasgow or Tokenbury - - -	C.	620	2	..	115	Welsh.
5	Caradon, East - - -	C.	550	..	..	..	
6	Caradon, Great - - -	C.	..	..	..	..	
7	Caradon, South - - -	C.	2,500	..	..	..	Welsh.
8	Caradon Vale - - -	C.	150	..	..	..	Welsh.
9	Caradon, West - - -	C.	1,420	..	..	..	Welsh.
10	Craddock Moor - - -	C.	700	..	..	..	Welsh.
11	Drake Walls - - - -	T. & C.	602	2	100	80	Welsh.
12	Drake Walls, West - -	T.	237	..	..	..	Welsh.
13	Emily Wheal - - - -	S. L.	..	..	..	..	
14	Gonomena - - -	C.	450	..	..	..	Welsh.
15	Gunnis Lake and S. Bedford	C.	..	..	..	50	Welsh.
16	Gunnis Lake, Old - -	C.	550	3	36	..	C. Lambert and Co.
17	Herodsfoot - - - -	S. L.	720 (1867) 626 (1868)	2	..	..	C. Lambert and Co.
18	Hooper, Huel - - -	..	235	..	..	..	C. Lambert and Co.
19	Hingston Down Consols -	T.	615	2	135	45	Welsh.
20	Marke Valley - - -	C.	1,300	..	..	..	Welsh.
21	Mary Ann, Huel - - -	S. L.	1,800	3	315	..	Welsh.
22	Ohel Tor - - - -	T.	714	2	..	2	Welsh.
23	Phœnix - - - -	T. & C.	2,500	..	..	..	Welsh.
24	Phœnix, East - - -	C.	620	..	..	..	Welsh.
25	Phœnix, North - - -	C.	..	..	..	12	Newport.
26	Prince of Wales, West - -	T. & C.	100	1	..	10	Welsh.
27	Red Moor - - - -	C.	..	..	..	..	
28	Sharp Tor, West - - -	..	725	..	..	..	Welsh.
29	Rose Down, West - - -	C.	210	..	..	15	Welsh.
30	Trelawney - - - -	S. L.	3,033	..	..	..	
31	Treweatha - - - -	S. L.	1,921	2	500	41	Welsh.
	Total -		23,002	19	1,142	394	

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Eastern District—*continued.*	Coal used for Engines.	Coal used for other Purposes.
	Tons.	Tons.
12 mines from which returns were not received, estimated -	7,600	300
Total - - -	30,602	694
Used for engines - - - - - - - -	30,602	..
Used for mine, &c. - - - - - - -	694	..
Total of Eastern District - - - - - -	31,296	..

APPENDIX, TABLE No. 132.

COAL used at DEVONSHIRE MINES.

No. of Mines making Returns.	Name of Mine.	Kind of Ore raised.	Coal used for Engines.	No. of Engines returned.	Actual Horse Power returned.	Coal used for other Purposes.	Description of Coal.
			Tons.			Tons.	
1	Bamfylde - - - - -	C.	..	..	..	33	
2	Bedford Consols - - - -	C.	..	..	..	4	Sunderland.
3	Bedford United - - - -	C.	153	..	..	30	Port Talbot.
4	Belstone Consols - - - -	C.	..	..	..	20	Smith's coal.
5	Bottle Hill - - - - -	T.	..	..	..	20	
6	Chillaton - - - - -	M.	50	1	13	2	Welsh.
7	Crebor, Huel - - - -	C.	..	..	..	19	Newport.
8	Devon Great Consols - - -	C.	1,915	8	153	1,104	Welsh 2492, Newcastle 527.*
9	Druid - - - - -	C.	680	2	50	15	Common Welsh.
10	Emma, Huel - - - - -	C.	16	..	..	10	House coal.
11	Exmouth Silver Lead - - -	S. L.	..	..	..	10	Welsh.
12	Exmouth, South - - - -	S. L.	262	1	20	10	Welsh.
13	Frank Mills - - - - -	S. L.	1.290	3	216	50	Welsh Coal.
14	Friendship, Huel - - - -	C.	120	1	..	83	Common Welsh.
15	Gawton, Copper - - - -	C.	360	2	74	20	Neath Abbey.
16	Gunnis Lake, East & South Bedford	C.	..	..	..	50	Newport and Port Talbot.
17	Lifton Manganese - - - -	M.	..	..	..	54	
18	Molland - - - - -	C.	206	..	20	10	Newport.
19	Russell, New, East - - -	C.	1,298	2	110	8	Common Welsh.
20	Russell, Wheal - - - -	C.	..	..	..	6	Newport.
	Total -		6,352	20	656	1,558	

* Some of this coal is consumed in the arsenic works on the mine.

Devonshire Mines.	Coal used for Engines.	Coal used for other Purposes.
	Tons.	Tons.
28 mines (several of them small) from which no returns have been received, estimated - - - - - -	4,500	750
Total - - -	10,852	2,306
Used for engines - - - - - - - -	10,852	..
Used for mine, &c. - - - - - - -	2,306	..
Total used in Devonshire - - - - -	13,160	..

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APPENDIX, TABLE No. 133.

COALS CONSUMED at the following MINES from Jan. 1 to Dec. 31, 1866.

—	Coals burnt per Month.	Per Year.	Average Duty.	—	Coals burnt per Month.	Per Year.	Average Duty.
	Tons. cwts.	Tons. cwts.	Millions.		Tons. cwts.	Tons. cwts.	Millions.
Wheal Rose Mine, 70-in. engine	130 7			North Treskerby Mine, 54-in. engine	112 10		
24-in. winding engine	20 0	1,984 4	65·0	18-in. winding engine	20 0	1,890 0	58·0
Account house, dry, and smith's shop	15 0			Account house, dry, and smith's shop	25 0		
New Chiverton Mine, 40-in. engine	30 0			Great West St. George Mine, 70-in. engine	45 0		
Account house and smith's shop	5 0	420 0	48·0	24 winding engine	17 0	840 0	40·0
East Chiverton Mine, 30-in. engine	16 0	192 0	40·0	Account house, dry, and smith's shop	8 0		
South Wheal Francis Mine, 75-in. engine	60 0			Wheal Kitty Mine, 50-in. engine	..	..	57·0
Two winding engines	20 0	1,212 0	55·0	30-in. stamping engine	..	..	46·0
Account house, smith's shop, and dry	21 0						
Hallenbeagle Mine, 60-in. engine	115 0			Penhalls Mine, 50-in. engine	..	..	60·0
22-in. winding engine	20 0	1,749 0	64·0	36-in. stamping engine	..	..	48·0
Account house, dry, and smith's shop	10 15						

APPENDIX, TABLE No. 134.

QUANTITIES of COAL imported into LOOE, and passing over the Liskeard and Looe Union Canal Companies' Railway.

—	1863.	1864.	1865.	1866.	1867.	1868.
	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.
South Caradon	1,982 0 0	2,145 0 0	2,592 0 0	2,299 0 0	2,491 0 0	2,569 0 0
Phœnix	1,514 0 0	2,020 0 0	2,564 0 0	2,639 0 0	2,890 0 0	3,178 0 0
Craddock Moor	789 0 0	665 0 0	762 0 0	730 0 0	614 0 0	666 0 0
West Caradon	1,429 0 0	1,349 0 0	1,388 0 0	1,235 0 0	1,234 0 0	1,330 0 0
Gonamena	259 0 0	399 0 0	538 0 0	425 0 0	424 0 0	550 0 0
Sharp Tor West	743 0 0	639 0 0	690 0 0	749 9 0	..	..
Huel Hooper	330 0 0	356 0 0	471 0 0	133 0 0	..	..
Marke Valley	1,229 0 0	1,283 0 0	1,258 0 0	1,309 0 0	1,266 0 0	1,408 0 0
East Caradon	590 0 0	518 0 0	539 0 0	568 0 0	632 0 0	585 0 0
Tokenbury or Glasgow, Caradon Consols	828 0 0	787 0 0	989 0 0	1,214 0 0	293 0 0	497 0 0
West Rose Down	228 0 0	236 0 0	214 0 0	210 0 0	277 0 0	285 0 0
Caradon Vale	277 0 0	405 0 0	136 0 0	..	..	..
South Phœnix	515 0 0	351 0 0	..	..	..	..
East Phœnix	563 0 0	337 0 0	619 0 0	674 0 0	469 0 0	577 0 0
Trelawney Wheal	..	..	..	..	3,440 0 0	3,033 0 0
Sundries	354 0 0	337 0 0	386 0 0	299 0 0	..	..
Huel Norris	..	..	302 0 0	305 0 0	..	..
Total	11,680 0 0	11,827 0 0	13,448 0 0	12,789 0 0	14,030 0 0	14,668 0 0
Herodsfoot Mine uses	..	..		720 0 0	..	..

LISKEARD and LOOE Union Canal.

Mine coal	14,201 12 1	13,886 13 1	15,562 19 0	14,652 11 1	..	..
House coal	4,696 14 1	6,192 19 2	6,529 12 0	6,151 4 0	7,020 0 0	5,623 0 0
Culm	737 17 2	792 5 3	977 4 0	952 10 0	655 0 0	1,089 0 0
Looe, local consumption	..	..	..	1,200 0 0	..	..

Herodsfoot not included in the above, nor Mary Ann. All the above landed at Looe, but the local consumption of the towns and neighbourhood of E. and W. Looe will be the excess of the above.
Liskeard town h assome coal from St. Germans.

FURTHER PARTICULARS respecting the Coal received and used in DEVONSHIRE and CORNWALL.

APPENDIX, TABLE No. 135.

COAL DELIVERED on the RIVER TAMAR, and by the TAVISTOCK CANAL.

The quantity of house coal carried in 1867 over the Tavistock canal was 2,133 tons:—
Of culm for lime-burning and malting purposes - - - - 1,080 tons.
In 1868:—House coal - - - - - - - - - 1,945 „
Culm - - - - - - - - - 1,481 „
No mining coal.

The quantities of coal discharged at Morwellham and Newquay (on the Tamar) in 1868 were as follows:—
Morwellham - - - - - - - - - - 6,437 tons.
Newquay - - - - - - - - - - 2,000 „

Small lots were brought up the river and discharged at points between Newquay and the Weir Head, but as they were brought from Plymouth coal merchants the return from thence will cover all such.

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APPENDIX, TABLE No. 136.

QUANTITIES of MINING COAL imported at DEVORAN and carried to different Mines and Places.

Names of Mines.	1865.	1866.
	Tons.	Tons.
North Jane	435	410
Great Wheal Baddern	1,511	1,012
Wheal Jane	850	1,931
Wheal, Falmouth, and Sperries	1,312	1,663
Naugllies	1,322	1,254
*Clifford Amalgamated	16,278	17,513
*St. Day United	2,359	2,813
Creegbroaze	484	296
West Clifford	371	..
New Clifford	..	140
East Buller	112	204
*Wheal Buller	1,619	1,725
*Copper Hill	260	414
*Clijah and Wentworth	396	112
*Wheal Uny	2,367	2,206
*East Carn Brea	1,504	410
*East Bassett	505	431
*West Bassett	182	26
*North Bassett	759	539
*South Bassett	540	501
*Wheal Bassett	1,922	1,416
*South Carn Brea	1,125	669
*South Frances	177	36
*North Frances	121	..
West Tolgus	1,683	1,856
South Tolgus	1,768	1,422
East Tolgus	157	98
*Wheal Union	57	..
*Grambler and St. Aubyn	166	132
*Pednandren	2,331	2,342
	42,673	41,071

* The mines marked thus * obtained some of their coal from other ports.

Distribution of Coal.	1865.	1866.
	Tons.	Tons.
Smelting works and manufactures	3,725	3,176
House coal carried to other places	6,235	4,096
In addition to the above, house and other coal were imported by:		
Vivian and Son — Chacewater, Gwennap	4,655	4,399
Vivian and Son — Ponsanooth	249	225
Vivian and Son — Bissoe	151	160
Vivian and Son — Truro	141	24
Vivian and Son — Wheal Jane	849	1,980
Vivian and Son — Gt. S. Wh. Baddern	1,510	1,012
Brogden and Sons	..	1,174*
Point Smelting Works	..	..
Perran Foundry Company	..	2,000
Total	17,515	18,196

* Messrs. Brogden and Sons forwarded to the port of Cornwall as follows:—

	1867.	1868.
	Tons.	Tons.
House coal	16,793	16,307
Steam coal	2,106	1,047
Through	504	170
Mining	15,184	34,102
Nuts	—	804
Total	34,587	52,430

APPENDIX, TABLE No. 137.

TABLES of IMPORTS of HOUSE and MINE COAL at all CORNISH PORTS.

No. 1.

AN ACCOUNT of the Quantity of COALS IMPORTED into the County of CORNWALL in the Year 1829.

Names of Ports.	Coals and Cinders.		Culm.
	Tons.	Chds.	Chds.
Fowey	8,174	5,739	3,908
Falmouth	9,472	1,298	793
Gweek	1,479	1,165	549
Truro	9,052	16,786	2,488
Pensance	5,746	3,916	559
Scilly	762	16	9
Saint Ives	..	43,369	317
Padstow	13,029	4,106	1,242
Total	47,714	76,395 or 97,448 tons.	10,365 or 13,165 tons.

Total coal and culm imported, 158,327 tons.—Vol. 27, 1830, p. 131, Accounts and Papers, House of Commons Library.

No. 2.

AN ACCOUNT of the Number of VESSELS and TONS of COALS landed at ST. IVES HARBOUR in the Years 1865 and 1866.

Year.	Mining Coals.		Household Coals.	
	Ships.	Tons.	Ships.	Tons.
1865	92	11,668	57	4,448
1866	88	11,171	54	4,697
	180	22,839	111	9,140
			180	22,839
			291	31,979

Add not less than 10 per cent. to the quantity of coals.

No. 3.

COALS LANDED at PENZANCE and MOUNT'S BAY in 1865 and 1866.

PENZANCE.

November 1864 to 1865 — 49,557 tons.
Do. 1865 to 1866 — 43,637 „

Mount
Porthleven } 20,000 tons.
Newlyn

No. 4.

COAL received at CORNISH PORTS as per Custom House Returns.

Names of Ports.	1867.	1868.
Fowey, including Looe, Par, Charlestown, and Pentuan	72,234	61,369
Falmouth, including Penryn and Gweek	42,457	36,715
Truro, including Devoran, Point, and Mopus	90,776	75,661
Penzance, including St. Michael's Mount, Porthleven, Newlyn, and Mousehole	57,492	50,448
Hayle, including St. Ives, Portreath, and St. Agnes	199,200	162,194
Scilly	2,176	1,677
Padstow, including Boscastle, Port Isaac, and Newquay	43,232	36,156
Total	507,567	424,220

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No. 5.

Coal received at Cornish Ports and Creeks, distinguishing, as far as possible, House and Manufacturing Coal from Mine Coal.

Names of Ports.	House Coal.		Mine Coal.	
	1867.	1868.	1867.	1868.
	Tons.	Tons.	Tons.	Tons.
Penzance	14,698	50,448	29,396	Not distinguished; included in house coal.
Portleven	7,155	8,080	6,921	4,967
Falmouth	21,942	20,766	Not distinguished.	
Penryn	9,846	7,496	Ditto.	
Gweek	10,669	8,514	Ditto.	
Devoran*, Point, Mopus, Truro	90,776	75,661	Ditto.	
Looe†	23,643	19,893	14,662	15,808
Fowey‡	5,102	3,684	Not distinguished.	
Par	4,494	4,664	16,980	12,256
St. Germans	..	..	..	..
Pentewan	5,940	5,968	Not distinguished.	
Charlestown	18,258	15,810	Ditto.	
Padstow	15,252	15,194	*Culm* 259	*Culm* 368
Boscastle, New Quay, Port Isaac	27,721	20,594	Not distinguished.	
St. Agnes§	3,605	2,684	5,904	3,891
Portreath	10,000	9,670	60,000	75,919‖
Hayle: Railway	..	..	..	
Harvey and Co.	17,646	19,678	31,406	26,838
Sandy's and Co.	9,538	..	10,571	—
Lelant	600	..	Not distinguished.	
St. Ives	..	..	..	..
Scilly	2,176	1,677	No mine coal.	
Total	298,961	290,971	165,880	139,699

* See next table for Devoran imports and distribution.

† Looe local consumption, about 1,200 tons a year.

‡ Fowey imported in

1857.	1858.	1859.
Tons.	Tons.	Tons.
6,180.	5,097.	6,029.

§ Imports of house coal at Trevaunance Pier for the following years, viz.:—

	Tons.	cwt.
From 1st April 1860 to 31st March 1861	3,292	16
,, ,, 1861 to ,, ,, 1862	3,801	18
,, ,, 1862 to ,, ,, 1863	3,345	2
,, ,, 1863 to ,, ,, 1864	3,485	18
,, ,, 1864 to ,, ,, 1865	3,667	6
,, ,, 1865 to ,, ,, 1866	3,412	2

Imports of coal at Trevaunance Pier, and consumed for mining purposes for the following years, viz.:

	Tons.	cwt.	qrs.
From 1st April 1860 to 31st March 1861	7,398	0	2
,, ,, 1861 to ,, 1862	6,674	4	3
,, ,, 1862 to ,, 1863	6,293	16	3
,, ,, 1863 to ,, 1864	7,059	12	0
,, ,, 1864 to ,, 1865	6,569	0	2
,, ,, 1865 to ,, 1866	6,517	12	2

This coal was used at the following mines:—North Chiverton, New Chiverton, Huel Prudence, Great Retallack, Polberro, Polbrean, Huel Kitty, and Penhalla.—These are at work, March 14th, 1867. Some others at Budnick, Huel Vlow, Duchy and Peru, Mount, and Huel Betsy were at work in the years given. Tywarnhayle and Huel Ellen will I suppose have had coal.

‖ Carried over the West Cornwall Railway from Hayle and Portreath.

Summary of Returns for 1867 and 1868, as given in Table No. 5.

Description of Coal.	1867.	1868.
	Tons.	Tons.
House coal	298,061	290,971
Mine coal	165,880	139,699
Culm	259	368
Total	464,150	430,438

Appendix, Table No. 138.

Summary of the Returns of Coal used in the Mines of Cornwall and Devonshire.

District.	Country embraced.	Number of Mines making Returns.	Number of Engines returned.	Coal used for Engines.	Coal used for other Purposes.
				Tons.	Tons.
CORNWALL:— Western	To the Westward of the Port of Hayle and Marazion.	36	78	29,448	2,265
West Central	From a line drawn from Truro Northward, to the West as far as Marazion and Hayle.	89	85	109,204	6,780½
East Central	The country around St. Austell, St. Blazey, and Westward from Bodmin.	10	13	9,188	158
Eastern	Liskeard to the Eastern boundary of Cornwall at the river Tamar.	31	19	23,002	394
DEVONSHIRE	From the Tamar Eastward to Tavistock and Oakhampton, and the Mines around Chudleigh and Buckfastleigh.	20	20	6,352	1,558
	Total	186	215	177,194	11,150½

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Appendix, Table No. 139.

LIST OF SMELTING AND METAL EXTRACTION COMPANIES IN THE UNITED KINGDOM.

TIN.

H. J. Enthoven and Sons, Charlestown, Cornwall.
Bolitho and Company, Chyandour and Angarrack, Cornwall.
Williams and Company, Trethellan and Mellinear, Cornwall.
Daubuz and Company, Cavedras and Treluswell, Cornwall.
R. R. Michell and Company, Stablehobba, Penzance, Cornwall.
Bissoe Bridge Company, Bissoe, near Truro, Cornwall.
Redruth Tin Smelting Company, Redruth, Cornwall.
Truro " " Truro, Cornwall.
Calenick " " Calenick, Cornwall.

COPPER.

Vivian and Sons, Swansea.
P. Grenfell and Sons, Swansea.
Sims, Willyams, Neville, Druce, and Company, Llanelly.
Williams, Foster, and Company, Swansea.
Mason and Elkington, Pembrey.
Copper Miners Company, Aberavon.
Charles Lambert, Swansea.
Newton, Keates, and Company, Holywell and Liverpool.
The Alkali Company (Limited), Liverpool.
The Briton Ferry Company, Briton Ferry.
Mona Mining Company, Amlwch, Anglesea.
Bibby, Sons, and Company, St. Helen's and Liverpool.
Henry Baxter, St. Helen's.
Evans and McBryde. St. Helen's.
James Radley, St. Helen's.
Key and Sons. Whiston Works, Cheadle, Staffordshire.
St. Helen's Smelting Company, St. Helen's.
Neath Copper Company, Neath.
Sweetland, Tuttle, and Company, Swansea.
Goole Alum and Smelting Company, Goole.
Pontifex and Wood, Garratt.

LEAD.

Stock and Company, Penclawd, Swansea.
Sims, Willyams, Neville, and Company, Llanelly.
The Bury Port Smelting Company (Limited), Llanelly.
The Runcorn Smelting Company, Runcorn.
Thomas Somers, Bristol.
Sheldon Bush and P. S. Company, Bristol.
Weston and Collingborn, Bristol.
W. J. Cookson and Company, Newcastle.
Locke, Blackett, and Company, Newcastle.
John Warwick, Newcastle.
Shield and Dinning, Haydon Bridge.
Howden Smelting Company, Newcastle.
Washington Chemical Company, Newcastle.
Enthoven and Sons, London.
Lock, Lancaster, and Company, London.
Pontifex and Wood, Farringdon Works, London.
Trustees Treffry's Estate, Par, Cornwall.
R. Michell and Son, Truro, Cornwall.
Peter Glover, Warrington.
Delafield White Lead Company, near Wrexham, Flintshire.
Adam Eyton, Llanerchymor, Holywell.
The Brymbo Company, Brymbo.
* Alfred Courage and Company, Bagillt (now zinc).
Walker, Parker, and Company, Dee Bank, Bagillt, and Newcastle.
Governor and Company of Lead Smelters, Nenthead, Alston Moor.
W. B. Beaumont, Allendale, Alston Moor.
Benjamin Bagshaw, Eyam, near Bakewell.
Barker and Rose, Alport, Bakewell, and Sheffield.
Joseph Wass and Company, Lea Lead Works, Matlock Bath.
Snailbeach Lead Company, near Shrewsbury.
Pontesford Smelting Company.
Meerbrook Lead Works (E. Cockburn), Meerbrook, Matlock Bath.
Gibbs and Company, Bonsale Dale, Matlock.
Via Gellia Lead Works, Cromford, Matlock Bath.
Robert Howe Ashton, Castletown, Derbyshire.
J. Fairburn and Company, Middleton Dale and Bradwell.
T. Wilson and Company.
E. Backhouse, Darlington.
Greenside Mining Company, Penrith.
The Held Head Mining Company, Wensleydale.
George York, Pately Bridge.
Duke of Devonshire, Grassington.
C. L. Bradley and Company.
The Duke of Buccleuch, Wanlock Head.
The Lead Hills Mining Company, Lead Hills.
The Hurst Mining Company, Hurst.
Lister, Robinson, and Company, Grinton Moor.
R. M. Jaques and Company, Arkengarthdale.
G. Robinson, Surrender.
R. M. Jaques and Company, Old Gang.
The Blakethwaite Lead Company, Blakethwaite.
R. Milner and Company, Belde Hill.
The Swaledale Lead Company, West Swaledale.
Somersetshire :
Charterhouse, Blagdon, Bristol.
Mendip Mining Company.
Waldegrave Lead Smelting Company (Limited), Mendips near Wells.
East Harptree Lead Works (Limited), East Harptree, Bristol.
St. Cuthbert Works, Mendips, near Wells.
The Mining Company of Ireland.

ZINC.

Vivian and Sons, Swansea.
William Marsden, Oldland Hall, near Bristol.
Kenrick and Son, Wynn Hall, Spelter Works, Ruabon.
* Mines Royal Copper Company, Neath (ceased to smelt).
Charles Titterton, Phœnix Zinc Works, Warrington Junction.
J. H. Dillwyn, M.P., Swansea.
J. Collingborne, Spelter Works, Warmley, Bristol.
Joseph Thompson, Spelter Works, Carlisle.
The Bagillt Smelting Company, Bagillt.
Ryland Brothers, Warrington.
T. Gilby.
Joseph Wethered, Bristol.

PYRITES PRECIPITATE SMELTING COMPANIES.

Duncan McKechnie, St. Helen's.
The Widnes Metal Company, Widnes.
The Tharsis Sulphur and Copper Company, Widnes.
" " " Newcastle.
" " " Birmingham.
" " " Glasgow.
N. Mathieson and Company, Runcorn.
The Runcorn Soap and Alkali Company, Runcorn.
Newton Heath Reduction Company, Manchester.
Muspratt Brothers and Huntley, Flint.
The Mostyn Copper Company, Mostyn.
Solomon Mease and Son, Newcastle.
William Russell and Company, Newcastle.
J. and W. Allan, Newcastle.
The Bede Metal Company, Newcastle.
W. Hunt and Sons, Leabrook, Wednesbury.
William Hunt and Company, Castleford.
H. Blair and Company, Kearnsley, Bolton, Lancashire.
William Haslam, Bolton, Lancashire.
H. L. Pattinson and Company, Gateshead.

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IRON MANUFACTURE.

Appendix, Table No. 140.

Details of Blast Furnaces in Blast, and of the Make of Pig Iron in the Year 1869.

ENGLAND.

NORTHUMBERLAND.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Bedlington	Bedlington Iron Company	2	0	
2	Brinkburn	Brinkburn Iron Company	2	0	
3	Haltwhistle	Joseph Beasley, jun.	1	0	
4	Elswick	Sir W. G. Armstrong and Company	2	1	
5	Hareshuw	Hareshaw Iron Company	3	0	
6	Lemington-on-Tyne	Bulmer and Company	2	0	
7	Walker	Losh, Wilson, and Bell	3	0	
8	Wallsend	Palmer's Shipbuilding and Iron Company (Limited)	2	0	
9	Wylam	Bell Brothers	1	0	
		Total of Northumberland	18	1	15,942

DURHAM.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Acklam, Middlesbro'	Stevenson, Jacques, and Company	4	4	
2	Birtley, Chester-le-St.	Birtley Iron Company	3	0	
3	Carlton, Stockton	S. Bastow and Company	2	0	
4	Bradley	Consett Iron Company (Limited)			
5	Consett, Gateshead	Do. do.	17	5	
6	Crook Hall	Do. do.			
7	Clarence	Bell Brothers and Company	8	8	
8	Felling, Gateshead	H. L. Pattison and Company	2	0	
9	Ferry Hill	Rosedale and Ferryhill Iron Company (Limited)	8	8	
10	Jarrow	Palmer's Shipbuilding and Iron Company (Limited)	5	4	
11	Middleton	Middleton Iron Company (Limited)	2	0	
12	Norton	Norton Iron Company (Limited)	4	2	
13	South Durham, Darlington	South Durham Iron Company	3	2	
14	Towlaw	Weardale Iron and Coal Company (Limited)	5	3	
15	Stockton-on-Tees	Stockton Rail Mill Company (Limited)	3	1	
16	Thornaby, Stockton	William Whitwell and Company	3	3	
17	Vane and Seaham	Earl Vane	2	0	
18	Washington	Washington Iron Company	1	0	
19	Wear, Washington	Bell Brothers	1	0	
		Total of Durham	73	40	658,506

YORKSHIRE, North Riding or Cleveland District.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Beck Holes	Whitby Iron Company	2	0	
2	Cargo Fleet	Swan, Coates, and Company	2	2	
3	Clay Lane, Eston Junction	Clay Lane Iron Company	6	6	
4	Cleveland				
5	Middlesbro'	Bolckow, Vaughan, and Company (Limited)	18	12	
6	Witton Park				
7	Glaisdale, Yarmouth	Firth and Hodgson	3	0	
8	Grosmont	Chas. and Thos. Bagnall, jun.	2	2*	
9	Newport	B. Samuelson and Company	5	5	
10	Normanby, Middlesbro'	Jones, Dunning, and Company	3	2	
11	Ormesby, Middlesbro'	Cochrane and Company	3	2	
12	South Bank, Middlesbro'	South Bank Iron Company	9	9	
13	Tees, Middlesbro'	Gilkes, Wilson, Pease, and Company	8	3	
14	Tees Side, Middlesbro'	Hopkins, Gilkes, and Company (Limited)	4	4	
15	Linthorpe	Lloyd and Company	4	4	
		Total of North Riding	69	51	766,410

* One out for three months.

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YORKSHIRE, West Riding.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Ardsley, Leeds	West Yorkshire Iron and Coal Company	2	2	
2	Beeston Manor	A. Harding and Company	2	1	
3	Bowling	The Bowling Iron Company (Limited)	6	4	
4	Elsecar, Barnsley	W. H. and Geo. Dawes	6	4	
5	Milton, Barnsley				
6	Farnley	Farnley Iron Company	4	1	
7	Holmes	Parkgate Iron Company (Limited)	3	3	
8	Parkgate				
9	Low Moor	Hird, Dawson, and Hardy	8	5	
10	Bierley				
11	Thorncliffe and Chapeltown, Sheffield	Newton, Chambers, and Company	2	1	
12	Worsborough	Worsborough Iron Company	1	0	
13	White Horse, Leeds	R. & W. Garside	2	1*	
14	Hepworth	Hepworth Iron Company	2	0	
		Total of West Riding	38	23	105,765

* Cold blast, part of the year only.

DERBYSHIRE.

					Tons.
1	Alfreton	Jas. Oakes and Company	3	2	
2	Butterley Park, Alfreton	The Butterley Company	6	5	
3	Codnor				
4	Clay Cross	The Clay Cross Iron Company	3	2	
5	Denby, Derby	W. H. and G. Dawes	4	2	
6	Morley Park, Belper	Charles C. Disney	2	2	
7	Newbold, Chesterfield	S. Beale and Company	1	1	
8	Oakerthorpe, Alfreton	J. B. Wilson	2	0	
9	Renishaw, Eckington	F. R. Appleby	2	2	
10	Sheepbridge, Chesterfield	The Sheepbridge Coal and Iron Company (Limited)	4	4*	
11	Stanton, Nottingham	The Stanton Iron Works Company	5	4	
12	Staveley, Chesterfield	Staveley Coal and Iron Company (Limited)	4	4†	
13	Unstone, Sheffield	Henry Rangely	1	0	
14	West Hallam, Ilkeston	H. B. Whitehouse and Sons	3	1	
15	Wingerworth, Chesterfield	Wingerworth Iron Company	3	2	
		Total of Derbyshire	48	31	188,353

* One out for three months. † One for six months only.

LANCASHIRE.

					Tons.
1	Barrow Hæmatite	Barrow Hæmatite Steel Company (Limited)	11	11	
2	Newland	Harrison, Ainslie, and Company	4	2	
3	Backbarrow				
4	Kirkless Hall	Wigan Coal and Iron Company	5	7	
5	Furness	Furness Iron Company	2	0	
6	Carnforth	Carnforth Hæmatite Iron Company (Limited)	4	4	
7	Ditton Brook, Widnes	Ditton Brook Iron Company	4	3	
		Total of Lancashire	30	27	436,662

CUMBERLAND.

					Tons.
1	Whitehaven	The Whitehaven Hæmatite Iron Company	6	3	
2	Duddon	Harrison, Ainslie, and Company	1	0	
3	Workington	The Workington Iron Company	6	2	
4	West Cumberland	West Cumberland Hæmatite Iron Company (Limited)	5	4*	
		Total of Cumberland	18	9	129,107

* One only thirty weeks.

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SHROPSHIRE.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Dark Lane	Leighton and Grenfell	4	3	
2	Hinkshay				
3	Dawley Castle	The Coalbrookdale Company	2	2	
4	Lawley		1	0	
5	Light Moor		2	2	
6	Ketley	The Ketley Company	1	1	
7	Lodge Wood	The Lilleshall Iron Company	9	8	
8	Prior's Lee				
9	Madeley Wood, Ironbridge	Messrs. Anstice	3	3	
10	Madeley Court	William Orme Foster	3	2	
11	Old Park	Old Park Iron Company	4	2	
		Total of SHROPSHIRE	29	23	197,443

STAFFORDSHIRE, NORTH.

					Tons.
1	Apedale, Newcastle	Stanier and Company	4	3	
2	Biddulph Valley	Robert Heath and Sons	3	4	
3	Clough Hall, Kidsgrove	Kinnersley and Company	4	4	
4	Fenton Park	C. Leighton and G. P. Knooker	2	0	
5	Goldendale, Stoke-on-Trent	Williamsons Brothers	4	3	
6	Lane End, Longton	T. Goddard and Brothers	3	2	
7	Shelton, Hanley	The Earl Granville	3	3	
8	Silverdale, Newcastle	Stanier and Company	4	3	
		Total of NORTH STAFFORDSHIRE	27	27	231,913

STAFFORDSHIRE, SOUTH.

					Tons.
1	Bridge, Bilston	David Jones	1	2	
2	Barbors Field, Bilston	Barbors Field Company	2	2	
3	Birchills, New, Walsall	Brayford	3	1	
4	Bloxwich Green Lanes, Walsall	John Jones	2	2	
5	Bovereux, Lower, Bilston	W. Baldwin and Company	7	0	
6	Brades Hall, Tipton	Jas. and Geo. Onions	4	2	
7	Bradley	G. B. Thorneycroft and Company	2	0	
8	Broadwaters, Wednesbury	Samuel Groucott and Sons	0	3	
9	Deepfields, Bilston	Deepfields Iron Company	3	1	
10	Brook, Bilston	The Brook Furnace Company	3	2	
11	Cape, Smethwick	Benjamin Richards	2	0	
12	Chillington, Wolverhampton	The Chillington Iron Company	9	3	
13	Lea Brook, Wednesbury				
14	Bentley, Walsall				
15	Caponfield, Bilston				
16	Coneygree	Earl of Dudley	7	2	
17	Level, New			5	
18	Corbyn's Hall, Dudley	Wm. Mathews	2	2	
19	Corbyn's Hall, New, Brierley Hill	Benjamin Gibbons, sen.	2	0	
20	Corngreaves, Rowley Regis	New British Iron Company	6	4	
21	Groveland	G. Hickman	1	1	
22	Darlaston Green, Wednesbury	The Darlaston Steel and Iron Company	3	3	
23	Dixon's Green, Dudley	John Jones	1	0	
24	Park Lane, Dudley Port	John Colbourn and Son	4	3	
25	Horseley, Tipton	John Colbourn and Son			
26	Dudley Wood	N. Hingley and Sons	4	2	
27	Capponfield	J. Bagnall and Sons	5	3	
28	Golds Hill, West Bromwich				
29	Hallfields	Moorcroft Colliery	1	0	
30	Hatherton, Walsall	W. F. Fryer	2	1	
31	Herbert's Park, Bilston	David Jones	1	0	
32	Crookhay, West Bromwich	W. and G. Firmstone	4	2	
33	Leys	Ditto	3	2	
34	Level, Old, Brierley Hill	Hall, Holcroft, and Pearsons	4	0	
35	Brettell Lane				
36	Millfield, Bilston	Mrs. Emily Gibbons	4	0	
37	Netherton	Earl of Dudley	2	2	
38	Netherton, New, Dudley	M. and W. Grazebrook	2	2*	
39	Oak Farm	Sir S. Glynn, Bart.	2	0	
40	Oldbury, Birmingham	Assignees of William Bennitt	4	0	
41	Old Park, Wednesbury	The Patent Shaft and Axletree Company (Lloyds, Foster, and Company Dept.)	3	2	
42	Osier Bed	Osier Bed Iron Company	3	1	
43	Park Head, Dudley	Evers and Martin	2	2†	
44	Parkfield, Wolverhampton	The Parkfield Iron Company	5	4‡	
45	Pelsall	Boaz Bloomer and Son	2	2	
46	Priestfield, New	Wm. Ward and Sons	2	1	
47	Prior Field, Bilston	Hy. Bickerton Whitehouse	3	3	

* All cold blast. † One for seven months. ‡ Estimated.

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No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
48	Rough Hay, Darlaston	Addenbrooke, Smith, and Pidcock	3	2	
49	Russell Hall, Dudley	Russell Hall Iron Company	2	0	
50	Shut End, Kingswinford	John Bradley and Company	4	3	
51	Spring Vale, Bilston	Alfred Hickman	3	2	
52	Stonefield	Stonefield Iron Company	1	0	
53	Stow Heath	W. J. Sparrow and Company	4	2	
54	Tipton	E. Cresswell and Sons (?)	2	0	
55	Tipton Green	Roberts and Company	4	4	
56	The Hange, Tividale, Tipton	Round Brothers	2	1	
57	Wednesbury Oak	Phillip Williams and Company	5	5*	
58	Union				
59	Willenhall	Fletcher, Solly, and Urwick	3	2	
60	Willingsworth	Sir Horace St. Paul	3	2	
61	Windmill End	Hickman and Company	1	1	
62	Wolverhampton	Assignees of Isaiah Aston and Company	2	0	
63	Woodside	Cochrane and Company	3	2†	
64	Withymoor, Dudley	W. H. Dawes	2	2	
		Total of SOUTH STAFFORDSHIRE	164	95	569,562

* Two cold blast; three hot blast.

† One out from October.

NORTHAMPTONSHIRE.

					Tons.
1	East End, Wellingbro'	Thos. Butlin and Company	2	2	
2	Irthlingborough	Ditto			
3	Finedon, Wellingbro'	Glendon Iron Ore Company	3	3	
4	Heyford, Weedon	George Pell	3	2	
		Total of NORTHAMPTONSHIRE	8	7	41,500

LINCOLNSHIRE.

					Tons.
1	Trent, Scunthorpe	W. H. and G. Dawes	3	2	
2	Frodingham, Scunthorpe	The Frodingham Iron Company	2	2	
3	North Lincolnshire, Frodingham, Brigg	North Lincolnshire Iron Works	1	1	
		Total of LINCOLNSHIRE	6	5	33,786

GLOUCESTERSHIRE.

					Tons.
1	Cinderford	Henry Crawshay	4	3	
2	Oakwood	Ebbw Vale Company	1	0	
3	Park End, Lydney	Forest of Dean Iron Company	3	2	
4	Soudley, Newnham	Goold Brothers	2	1*	
		WILTSHIRE.			
1	Westbury	Westbury Iron Company (Limited)	4	3	
		HAMPSHIRE.			
1	Warsash	Southampton	1	1†	
		SOMERSETSHIRE.			
1	Ashton Vale	Ashton Vale Iron Company (Limited)	2	1	
		Total of GLOUCESTERSHIRE, WILTSHIRE, HAMPSHIRE, and SOMERSETSHIRE	17	11	81,306

* Two months out of blast.

† A charcoal furnace.

WALES.

NORTH WALES.—DENBIGHSHIRE.

					Tons.
1	Brymbo	The Brymbo Iron Company	3	3*	
2	Ffrwd	Sparrow and Poole	2	2	
3	Ruabon	New British Iron Company	3	1	
		TOTAL of NORTH WALES	8	6	38,530

* One nine months; two three months.

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FURNACES USING ANTHRACITE.

SOUTH WALES.—GLAMORGANSHIRE.—BRECKNOCKSHIRE.—CARMARTHENSHIRE.—PEMBROKESHIRE.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Banwen	Llewelyn and Company	2	0	
2	Ystalyfera	Ystalyfera Iron Company	11	6	
1	Ynescedwyn	Ynescedwyn Iron Company	2	0	
1	Amman, Llanelly	Amman Iron Company	3	3	
2	Gwendreath, Llanelly	Daniel Watney	3	0	
1	Kilgetty, Narberth	Vickerman and Company	2	0	
		Total of ANTHRACITE FURNACES	23	9	27,909

FURNACES USING BITUMINOUS COAL.

GLAMORGANSHIRE.

					Tons.
1	Amman, Brynamman		0	3	
2	Aberdare	Fothergill, Hankey, and Lewis	5	3	
3	Abernant and Taffvale				
4	Briton Ferry	Willett and Davey	2	1	
5	Cwm Avon	Governor and Company of Copper Miners in England	7	3	
6	Oakwood	Ditto			
7	Cyfarthfa, Merthyr Tydfil	Robert Crawshay	11	9	
8	Ynisfach				
9	Dowlais	The Dowlais Iron Company	18	16	
10	Llynvi Vale and Maesteg, Bridgend	Llynvi Vale Iron Company	7	4	
11	Gadlys, Aberdare	Wayne and Company	4	3	
12	Melin Griffiths and Pentyrch	Thomas William Booker and Company	2	2	
13	Penydarran	Aberdare Iron Company	7	0	
14	Plymouth	Fothergill, Hankey, and Lewis	5	7	
15	Duffryn		5		
16	Pontypridd	Francis Crawshay	2	0	
17	Tondu	John Brogden and Sons	2	2	
18	Venalt, Neath Abbey	Neath Abbey Company	2	0	
		Total of GLAMORGANSHIRE	79	53	348,475

BRECKNOCKSHIRE.

					Tons.
1	Beaufort	J. and C. Bailey	7	6	
2	Clydach, New Abergavenny	New Clydach Steel and Bar Iron Company	4	0	
3	Hirwain	Hirwain Coal Company	4	0	
4	Onllwyn, Neath	Onllwyn Iron and Coal Company	2	0	
		Total of BRECKNOCKSHIRE	17	6	32,201

MONMOUTHSHIRE.

					Tons.
1	Abersychan	Ebbw Vale Iron Company (Limited)	6	5	
2	Pontypool	Ditto	4	1	
3	Sirhowy	Ditto	5	3	
4	Ebbw Vale	Ditto	3	3	
5	Victoria	Ditto	3	3	
6	Blaenavon	Blaenavon Iron Company	9	8	
7	Blaina				
8	Coalbrook Vale	Levick and Simpson	2	0	
9	Cwm Celyn				
10	Cwmbrân	R. S. Roper and Company	2	2	
11	Nantyglo	J. and C. Bailey	7	5	
12	Rhymney and Bute	Rhymney Iron Company	9	7	
13	Tredegar	Forman and Fothersgill	9	7	
		Total of MONMOUTHSHIRE	59	44	392,387

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SCOTLAND.

AYRSHIRE.

No.	Names of Works.	Owners.	Furnaces built.	Furnaces in blast.	Pig Iron made.
					Tons.
1	Ardeer	Merry and Cunningham	4	4	
2	Blair	Wm. Baird and Company	5	3	
3	Eglinton		1	7	
4	Lugar		4	4	
5	Muirkirk		3	3	
6	Portland		6	3	
7	Dalmellington	Dalmellington Iron Company	8	8	
8	Glengarnock	Merry and Cunningham	10	6	
		Total of AYRSHIRE	48	38	

LANARKSHIRE.

1	Calder	William Dixon	8	6	
2	Govan	Ditto	5	3	
3	Carnbrae	Merry and Cunningham	6	6	
4	Castle Hills	Shotts' Iron Company	7	6	
5	Shotts	Ditto			
6	Clyde	James Dunlop and Company	6	4	
7	Quarter	Colin, Dunlop, and Company	4	3	
8	Coltness	Coltness Iron Company	12	12	
9	Dundyvan	Trustees of John Wilson	0	0	
10	Gartsherrie	William Baird and Company	16	14	
11	Langloan	Robert Addie	8	8	
12	Monkland	Monkland Iron and Steel Company	9	9	
13	Omoa	Robert Stewart's Trustees	0	0	
14	Summerlee	Wilson and Company	8	8	
15	Wishaw	Wishaw Iron Company	8	3	
		Total of LANARKSHIRE	92	77	

FIFESHIRE.

1	Forth	Forth Iron Company	7	1	
2	Lochgelly	Lochgelly Iron Company	4	2	
3	Lumphinnans, Lochgelly	Lumphinnans Iron Company	2	1	
		Total of FIFESHIRE	13	4	

LINLITHGOWSHIRE.

1	Kinniel, Boness	George Wilson and Company	4	3†	

STIRLINGSHIRE.

1	Almond	James Russel and Son	3	2	
2	Carron	Carron Iron Company	3	4	
		Total	6	6	

HADDINGTONSHIRE.

	Gladsmuir or Westbank	C. and A. Christie	1	1	

ARGYLESHIRE.

1	Lorn	Harrison, Ainslie, and Company	1	1	
		Total of SCOTLAND	158	129	1,150,000

* Six in blast only for the first ten months.

† Three for two months; two for ten months.

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APPENDIX, TABLE No. 141.

CLEVELAND.

STATEMENT showing quantities of MATERIALS consumed, and cost of producing 11,550 6 1 of PIG IRON in 1867.

	Total Weight.	Price.	Amount.	Total Amount.	Cost per Ton of Pig Iron.
	Tons. cwts. qrs.	s. d.	£ s. d.	£ s. d.	£ s. d.
Ironstone	2,459 1 0	4 6	559 13 8		
Ditto	33,706 17 0	3 6	5,898 13 11		
Ditto	2,546 4 0	3 9	477 10 4		
Ditto	1,620 18 0	4 6	364 14 1		
Ditto	1,201 0 0	3 6	210 5 6		
			7,501 17 6		
Railway dues	—	—	1,833 2 2		
				9,334 19 8	0 16 3¼
	41,534 0 0				
			—	—	1 1 5¼
Fuel: Coke	16,585 0 0	14 8¼	12,262 18 3		
Breeze	13 0 0	8 0	5 4 0		
Coals	2,682 15 2	1 8¼	944 12 9		
				13,212 15 0	0 1 8¼
	19,280 15 2				
Limestone	10,365 8 0	3 0	1,554 11 2		
				1,554 11 2	0 2 8¼
Pugged Clay	360 10 0	11 0	198 5 8	—	0 0 4¼
Sand	469 7 0	3 0	70 8 1	—	0 0 3·35
Stores	—	—	157 14 3	—	0 0 3·29
				426 8 0	
Railways	—	—	74 11 4½		
Blast engines and Donkey's engine H., &c.	—	—	84 6 9		
Boilers	—	—	62 4 8		
Locomotives, repairs, and attendance	—	—	71 8 9½		
Heating stoves	—	—	18 9 8½		
				311 1 3½	0 0 7
Gauntree and kilns	—	—	—	266 13 3	0 0 5
Horsekeeping	—	—	—	78 0 0	0 0 1½
Labour making iron	—	—	—	1,602 3 2	0 2 9½
Sundry labour	—	—	—	347 4 7½	0 0 7¼
Foreman, weigh clerks, and timekeeper	—	—	—	219 4 8	0 0 4¼
Repairs	—	—	—	387 5 10	0 0 8
Stationery, office expenses, rent and taxes	—	—	—	119 8 3	0 0 2½
Salaries	—	—	—	413 14 8	0 0 8¼
Sundries	—	—	—	7 6 3	0 0 0¼
Repairs	—	—	—	18 9 8	0 0 0¾
Total cost at Works	—		—	28,299 4 6	2 9 5¼

APPENDIX No. 141 (*a*).

IRON.

COAL used to Ton of Bars at the Works of Fox, Head, and Company, Middlesbro'.

	Cwts.	qrs.	lbs.
Ordinary furnace, week ending August 10th, 1867	22	1	26
Patent furnace, week ending August 31st, 1867	16	1	4
„ „ Sept. 21st, 1867	16	0	26
„ fortnight ending Oct. 5th, 1867	16	0	14
„ „ Oct. 19th, 1867	17	0	20
„ week ending Dec. 7th, 1867	15	2	20
„ „ Dec. 14th, 1867	16	2	7
„ „ Dec. 21st, 1867	16	1	4

Ordinary furnaces / Patent „	Comparative trial under the same conditions.	22	10
		14	0 8
Patent furnace / Ordinary „	Pig used to a ton of bars.	22	0 24
		22	0 21

Patent furnace, week ending January 11th, 1868	16	1 20
„ fortnight ending Feb. 8th, 1868	15	3 18

Patent furnace / Ordinary „	Pig used to ton of bars.	22	0 3
		22	0 18

See Iron Trade Review, March 3rd, 1868.
The furnace is Jones, Howson, and Gjers' Patent.

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APPENDIX, TABLE No. 142.

LIST OF THE MILLS AND FORGES IN THE UNITED KINGDOM.

No.	Name of Works.	Name of Firm.	Nearest Port or Railway Station.	No. of Puddling Furnaces.	No. of Rolling Mills.
		ENGLAND.			
		NORTHUMBERLAND.			
1	Walker	Losh, Wilson, and Bell	Newcastle	56	5
2	Lemington-on-Tyne	Bulmer and Company	Leamington	10	0
		Total of	County	66	5
		CUMBERLAND.			
1	West Cumberland	West Cumberland Iron Company	Workington	40	3
2	Workington	Workington Hæmatite Iron Company	Ditto	10	4*
3	New Yard Iron Works	Kirk, Brothers, and Company	Ditto	14	3
		Total of	County	64	10
		*All iron used in making Bessemer steel.			
		DURHAM.			
1	Auckland	Jos. Vaughan	Bishop Auckland	10	0
2	Hartlepool	Hartlepool Malleable Iron Company	Hartlepool	21	2
3	Jarrow	Palmer's Shipbuilding and Iron Company (Limited)	Newcastle	80	6
4	Albert Hill	Darlington Iron Company	Darlington	190	5
5	Birtley	Birtley Iron Company	Chester-le-Street	6	1
6	Consett	Consett Iron Company (Limited)	Bishopwearmouth	151	8
7	Britannia	Hopper, Radcliff, and Company	Fence Houses	12	2
8	Gateshead	Hawks, Crawshay, and Company	Gateshead	60	5
9	Hive	John Elliot	East Jarrow	14	0
10	Monkwearmouth	Samuel Tyzack and Company	Sunderland	21	4
11	Tudhoe	Weardale Iron and Coal Company (Limited)	Ferry Hill	56	5
12	Skerne	Pease, Hutchinson, and Ledward	Darlington	34	2
13	West Hartlepool	T. Richardson and Sons	Hartlepool	80	2
14	Rise Carr	Fry, Janson, and Company	Darlington	18	3
15	Stockton Rail Mill	Stockton Rail Mill Company	Stockton	64†	2
16	Gateshead Park	J. Abbott and Company (Limited)	Gateshead	32	3
17	Felling Shore	Frazer, Roberts, and Company (Limited)	Ditto	30	2
18	Thornaby	W. Whitewell and Company	Stockton	20	3
19	Drinkfield	Drinkfield Iron Company	Darlington	26	3
20	Whessoe Works	J. H. Garbutt	Ditto	—	—
		Total of	County	925	58
		†And 16 rail-mill furnaces.			
		YORKSHIRE,—CLEVELAND DISTRICT.			
1	North Yorkshire	North Yorkshire Iron Company (Limited)	Middlesbro'	50	2
2	Cleveland	Bolckow and Vaughan	Ditto	175	11
3	Middlesbro'	Ditto	Ditto		
4	Witton Park	Ditto	Ditto		
5	Tees Side	Hopkins, Gilkes and Company (Limited)	Ditto	83	5
6	Newport	Fox, Head, and Company	Newport	36	2
7	Stockton	Stocton Malleable Iron Company	Stockton	60	5
8	Thornaby	Wm. Whitwell and Company	Ditto	28	3
9	Yorkshire	Richardson, Duck, and Company	Ditto	9	2
10	Westbourne	Holdsworth and Company	Ditto	16	1
11	West Stockton	West Stockton Iron Company	Ditto	19	3
		Total of	District	476	34
		LEEDS AND BRADFORD DISTRICT.			
1	Albert (Hunslet)	Bolland and Davy	Leeds	20	4
2	Clarence	Taylor, Brothers, and Company	Ditto	17	4
3	Farnley	Farnley Iron Company	Ditto	18	3
4	Kirkstall Forge	Messrs. T. J. O. and A. Butler	Ditto	22	3
5	Leeds	S. T. Cooper and Company	Ditto	13	5
6	Monk Bridge	Monk Bridge Iron Company	Ditto	26	6
7	Thornhill	Ditto	Ditto	10	3
8	Perseverance	J. Witham and Son	Ditto	20	5
9	Bowling	Bowling Iron Company	Bradford	26‡	6
10	Low Moor	Hird, Dawson, and Hardy	Ditto	38	7
11	Water Lane	J. Perkins and W. Terry	Ditto	6	3
12	Calder Vale	Samuel Witham	Wakefield	28	4
		Total of	District	244	53
		‡Crucible, cast-steel, 100 furnaces, 2 pots each.			

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SHEFFIELD AND ROTHERHAM DISTRICT.

No.	Name of Works.	Name of Firm.	Nearest Port or Railway Station.	No. of Puddling Furnaces.	No. of Rolling Mills.
1	Atlas (Swinton)	John Brown and Company	Sheffield	72	16
2	Cyclops	Ch. Cammell and Company (Limited)	Ditto	70	19
3	Steel Works (Grumsthorpe)	Ditto	Ditto	40	17
4	Yorkshire Steel and Iron Works (Penistone)	Ditto	Ditto		
5	Worthley	Andrews, Burrows, and Company	Ditto	12	4
6	Midland	Midland Iron Company	Rotherham*	29	4
7	Phœnix Foundry and Iron Works	Owen's Patent Wheel Tyre and Axle Company	Ditto	1	3
8	Park Gate	Park Gate Iron Company	Ditto	72	7
9	Northfield	Northfield Iron Company (Limited)	Ditto	19	3
10	Elsecar and Milton	W. H. and G. Dawes	Elsecar	63	7
		Total of District		378	80

* Nine re-heating furnaces.

DERBYSHIRE.

1	Butterley	F. Wright and W. Jessop	Alfreton	42	11
2	Railway (Litchurch)	Eastwood, Swingler, and Company	Derby	25	3
3	Victoria	Ditto	Ditto		
4	Whittington	Thomas Firth and Sons	Chesterfield	18	3
5	Sheepbridge	Sheepbridge Iron Company	Ditto	6†	1‡
		Total of County		91	18

† Double.

‡ Six double furnaces worked by mechanical means.

SOMERSETSHIRE.

1	Ashton Vale	Ashton Vale Iron Company	Bristol	10	4

SOUTH STAFFORDSHIRE.

1	Bank Field	Samuel Grocutt and Sons	Bilston	45	10
2	Bradley Field	Ditto	Ditto		
3	Batman's Hill	William Rose	Ditto	11	3
4	Bilston Mill and Forge	W. and J. J. Sparrow	Ditto	26	3
5	Bradley Tin Plate	Thomson, Hatton, and Company	Ditto	6	4
6	Bradley	Stephen Thompson	Ditto	9	2
7	Bradley, New	- - - -	Ditto	8	1
8	Deepfields	Ed. J. Gibbs	Ditto	12	2
9	Bilston Bridge	David Jones and Sons	Ditto	20	2
10	Herbert's Park	Ditto	Ditto		
11	Millfield	- - - -	Ditto	—	—
12	Britannia (Bradley)	Brereton and Company	Ditto	11	2
13	Regent	- - - -	Ditto	—	—
14	Stonefield	Bilston Iron Company	Ditto	11	2
15	Ettingshall	Morewood and Company	Ditto	12	4
16	Ebenezer	H. Onions and Company	Ditto	—	—
17	Brockmoor Tin Plate Works	Budd and Company	Brierley Hill	6	5
18	Harts Hill	Hingley and Smith	Ditto	32	3
19	Round Oak	Earl of Dudley	Ditto	56	5
20	Lanesfield	- - - -	Wolverhampton	40	5
21	Chillington	Chillington Iron Company	Ditto	60	13
22	Leabrook (Tipton)	Ditto	Ditto		
23	Bentley	Ditto	Ditto		
24	Capponfield (Bilston)	Ditto	Ditto		
25	Cleveland	Wright and North	Ditto	16	2
26	Monmore	Ditto	Ditto		
27	Minerva	Isaac Jenks	Ditto	23	4
28	Shrubbery	G. B. Thorneycroft and Company	Ditto	46	5
29	Swan Gardens	Ditto	Ditto	30	7
30	Birchills	James Bissell and Son	Walsall	14	2
31	The Birchills	Knowles and Company	Ditto	—	—
32	Horsely Fields	Osier Bed Iron Company	Ditto	24	6
33	Albion	Albion Steel and Iron Company	West Bromwich	8	2
34	Atlas	Israel Parks	Ditto	12	3
35	Brick House	P. Williams and Company	Ditto	8	2
36	Bromford	John Dawes and Sons	Ditto	69	7
37	Bradford	James Stanton and Company	Ditto	8	3
38	Hall End	J. T. and W. E. Johnson	Ditto	16	4
39	Waterloo	- - - -	Ditto		
40	Crook Hay	W. and G. Firmstone	Ditto	19	2
41	Witton's Lane	Field and Company	Ditto	—	—
42	Excelsior	Thos. P. Allen and Company	Ditto	11	1
43	Eagle	Eagle Coal and Iron Company	Ditto	12	
44	Staffordshire Works	Ditto	Ditto	8	1

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SOUTH STAFFORDSHIRE—*continued.*

No.	Name of Works.	Name of Firm.	Nearest Port or Railway Station.	No. of Puddling Furnaces.	No. of Rolling Mills.
45	Imperial	J. Bagnall and Sons	West Bromwich	32	2
46	Gold's Hill	Ditto	Ditto	13	2
47	Providence	Bridge, Gill, and Bridge	Ditto	16	2
48	Ridgacre	S. Whitehouse	Ditto	12	2
49	Rowhay	E. Page and Sons	Ditto	16	2
50	Stour Valley	Patent Nut and Bolt Company	Ditto	10	1
51	Coneygree Level, New	- - - -	- - - -	56	5
52	Stow Heath	- - - -	- - - -	26	3
53	Wellington	Holden	Ditto	11	2
54	Brierley Hill	New British Iron Company	Ditto	63	8
55	Corngreaves	Ditto	Ditto		
56	Gold's Hill, New	T. Davis	Ditto	12	2
57	Rabone Bridge	Jenkins, Ward, and Jenkins	Birmingham	10	2
58	Monmore Lane	Francis Deakin	Willenhall	14	4
59	Churchbridge	W. Gilpin and Company	Cannock	6	1
60	Old Park	Patent Shaft and Axle Company	Wednesbury	40	4
61	Brunswick	Ditto	Ditto		
62	Bull's Bridge	Moorcroft Colliery Company	Ditto	9	1
63	Tividale and Globe	J. O. Haines	Tipton	8	2
64	Bloomfield	W. T. and J. Barrows	Ditto	97	10
65	Factory	Ditto	Ditto		
66	Tipton Green	Ditto	Ditto		
67	Gospel Oak	Walter Robinson	Ditto	24	5
68	Church Lane	Jos. and Geo. Onions	Ditto	10	2
69	Summer Hill	W. Millington and Company	Ditto	16	4
70	Port Field	James Holcroft	Ditto	18	3
71	Brades	Wm. Hunt and Sons	Oldbury	—	—
72	Britannia	Bright, Perry, and Gettings	Ditto	13	1
73	Park Lane	F. R. Simpson and Company	Ditto	10	1
74	Cape Gun Barrel	Wm. Marshall	Smethwick	4	1
75	Anchor	Jas. Batson	Ditto	7	1
76	Cape	Benjamin Richards and Company	Ditto	7	1
77	Smethwick	J. Stone	Ditto	3	1
78	Cape Town	William Richard Brooks	Ditto	5	2
79	Crown	Thos. L. Nicklin	Ditto	11	3
80	Regent's Grove	George Bearde	Ditto	9	3
81	District	District Steel and Iron Company	Ditto	20	3
82	Brockmoor	Budd and Company, Tin Plate Works	Ditto	14	3
83	Brettle Lane	Brettle Lane Iron Company	Stourbridge	6	2
84	Bromley	- - - -	Ditto		
85	Bretwell Hall	Thos. Webb and Sons	Ditto	12	2
86	Cradley	Samuel Evers and Sons	Ditto	18	2
87	Leys	Brown and Freer	Ditto	30	7
88	Hyde	Lee and Bolton	Ditto	20	5
89	Stourbridge	John Bradley and Company	Ditto	16	0*
90	Whittington	Jas. Williams and Company	Ditto	9	2
91	Horsley Field Tin Plate Works (Horsleyfield)	E. P. and W. Baldwin	Wolverhampton	20	8
92	Swindon (Stourbridge)	Ditto	Stourbridge		
93	Wildon (Stourport)	Ditto	Stourport		
94	Corbyn's Hall	Hingley and Sons	Dudley	29	3
95	Dixon's Green	Dixon's Green Iron Company	Ditto	11	1
96	Dudley Port	Plant and Fisher	Ditto	7	3
97	Bull's Bridge	E. J. Gibbs	Wednesbury	—	—
98	Moxley	Thomas Wells	Ditto	10	3
99	Darlaston Green and King's Mill	Darlaston Iron and Steel Company	Ditto	38	8
100	Darlston	John Stones	Ditto	—	—
101	Globe (Pelsall)	Boaz Bloomer and Son	Ditto	41	5
102	Groveland	G. H. Hickman	Ditto	15	3
103	Great Bridge (Tipton)	Great Bridge Iron and Steel Company	Ditto	20	2
104	Sheep Wash	- - - -	Ditto	10	2
105	Wednesbury Oak	Philip Williams and Sons	Ditto	32	9
106	Victoria (Moxley)	D. Rose	Ditto	7	1
107	Victoria	R. Mills	Ditto	8	—
108	Churchbridge	W. Gilpin, sen., and Company	Ditto	8	1
109	Albert (Moxley	David Rose	Ditto	15	3
110	Monway	John Marshall	Ditto	7	2
		Total of District		1,700	282

* The puddled iron is sent to other works to be finished.

NORTH STAFFORDSHIRE.

1	Biddulph and Norton	Robert Heath	Tunstall	139	13
2	Ravensdale	Ditto	Ditto		
3	Chesterton	Chesterton Iron Company	Newcastle	12†	8
4	Clough Hall (Kidsgrove)	Kinnersley and Company	Stoke	75	7
5	Shelton Bar Iron Works	Shelton Bar Iron Company	Ditto	90	6

† Standing.

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NORTH STAFFORDSHIRE—*continued.*

No.	Name of Works.	Name of Firm.	Nearest Port or Railway Station.	No. of Puddling Furnaces.	No. of Rolling Mills.
6	Berry Hill	William Bowers	Stoke	19	2
7	Cliff Vale	Joseph Bull and Son	Ditto	21	5
8	Silverdale	Stanier and Company	Ditto	58	5
		Total of District		414	46

SHROPSHIRE.

1	Horsehay	Coalbrookdale Iron Company	Wellington	38	5
2	Stirchley	Leighton and Grenfell	Ditto	18	4
3	Ketley	Ketley Iron Company	Ditto	19	3
4	Eagle (Hollingswood)	The Eagle Iron Works Company (Limited)	Ditto	16	3
5	The Trench	The Trench Iron Company	Ditto	24	12
6	Wombridge	John Bennett and Company	Ditto	16	2
7	Heybridge	Heybridge Iron Company	Ditto	10	1
8	Old Park *	Old Park Iron Company	Shiffnal	31	4
9	Snedshill	Snedshill Iron Company	Ditto	36	5
		Total of County		208	39

* Four double and three single.

LANCASHIRE.

1	Bolton	Bolton Iron and Steel Company	Bolton	15	5
2	Mersey	Mersey Steel and Iron Company	Liverpool	30	4
3	Pendleton	William Barningham	Manchester	16	4
4	Openshaw	Ashbury Railway Carriage and Iron Company	Ditto	20	3
5	Star	Star Iron Company	Stockport	7	2
6	Dallam	Dallam Forge Company (Limited)	Warrington	42	7
7	Bewsey	Warrington Wire Iron Company	Ditto	40	7
8	Barrow	Barrow Hæmatite and Steel Company	Ulverstone	—	4
		Total of County		170	36

WALES.

NORTH WALES.

1	Broughton Hall	Wm. H. Darby and Company	Wrexham	12	2
2	Llay	Llays Iron Company	Ruabon	6	1
3	Ruabon	New British Iron Company	Ditto	38	3
		Total of District		56	6

SOUTH WALES.

GLAMORGANSHIRE.

1	Amman	Amman Iron Company	Llanelly	5	3
2	Margam (Tarbach)	Robt. B. Byass and Company	Aberavon	—	6
3	Clydach, New	John Tayne	Abergavenny	10	1
4	Gadlys	Wayne and Company	Aberdare	12	2
5	Llynvi Vale	Llynvi Vale Iron Company	Bridgend	—	—
6	Aberdare, Abernant, and Taff Vale	Fothergill, Hankey, and Lewis	Cardiff	60	4
7	Aberaman	Duffryn Steam Coal Company	Ditto	17	1
8	Pentyrch and Melin Griffith	T. W. Booker and Company	Ditto	7	12
9	Penydarran	Fothergill and Company	Ditto	14	4
10	Treforest (Pontypridd)	Treforest Tinplate Company	Ditto	7	4
11	Briton Ferry	Willet and Davey	Briton Ferry	40	3
12	Cyfarthfa and Ynisfach	Robert Crawshay	Merthyr Tydfil	74	5
13	Dowlais	Dowlais Iron Company	Ditto	150	12
14	Plymouth and Dwffryn	Fothergill, Hankey, and Bateman	Ditto	66	7
15	Cwm Avon (Tailbach)	Governor and Company of Copper Miners	Port Talbot	28	4
16	Ystalyfera	Ystalyfera Iron Company	Swansea	42	16
17	Tondu	John Brogden and Sons	Tondu	23	4
		Total of County		556	88

BRECKNOCKSHIRE.

1	Nantyglo	J. and C. Bailey	Newport	66	4

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MONMOUTHSHIRE.

No.	Names of Works.	Name of Firm.	Nearest Port or Railway Station.	No. of Puddling Furnaces.	No. of Rolling Mills.
1	Abersychan and Pentwyn	Ebbw Vale Iron Company	Newport	58	4
2	Victoria	Ditto	Ditto	38	—
3	Ebbw Vale	Ditto	Ditto	66	9
4	Pontypool	Ditto	Ditto	20	6
5	Blaina Cwm Celyn and Coalbrook Vale	Frederick Levick and Robert Simpson	Newport	—	—
6	Blaenavon	Blaenavon Iron Company	Ditto	80	6
7	Pontnewynydd	W. T. Henley	Ditto	20	2
8	Rhymney	Rhymney Iron Company	Ditto	84	7
9	Tredegar	Tredegar Iron Company	Ditto	71	6
10	Oakfields	James C. Hill	Ditto	28	7
11	Cwm Bram	Patent Nut and Bolt Company	Ditto	20	3
12	Llanelly	Llanelly Charcoal Iron Company	Ditto	2	2
		Total of District		482	52

SCOTLAND.

1	Blockhairn (St. Rollox)	Hannay and Sons	Glasgow	50*	4
2	Clifton	Colville and Gray	Coatbridge	20	2
3	Coats	Thomas Jackson	Ditto	17	2
4	Coatbridge	Thomas Ellis	Ditto	6	2
5	Drumpeller	Henderson and Dimmock	Ditto	18	3
6	Dundyvan	John Wilson's Trustees	Dundyvan	38	4
7	Glasgow	Glasgow Iron Company	Glasgow	47	6
8	Govan	William Dixon	Ditto	30	5
9	Monkland	Monkland Iron Company	Ditto	39	3
10	Mossend	Mossend Iron Company	Holytown	20	2
11	North British	Thomas Ellis	Coatbridge	8	3
12	Phœnix	John Spencer	Ditto	22	2
13	Rochsolloch	Rochsolloch Iron Company	Glasgow	13	3
14	Muirkirk and others	Wm. Baird and Company	Ditto	10	3
		Total of Scotland		338	44

* 32 single furnaces and 9 double ones.

SUMMARY OF MILLS AND FORGES AT WORK IN 1869.

County.	No. of Works.	No. of Puddling Furnaces.	No. of Rolling Mills returned.
England:			
Northumberland	2	66	5
Cumberland	8	64	10
Durham	19	925	58
Yorkshire (Cleveland District)	11	476	34
" (Leeds and Bradford District)	12	244	53
" (Sheffield and Rotherham District)	10	378	80
Derbyshire	5	91	18
Somersetshire	1	10	4
South Staffordshire	110	1,7000	282
North ditto	8	414	46
Shropshire	9	208	39
Lancashire	8	170	36
NORTH WALES	3	56	6
SOUTH WALES:			
Glamorganshire	17	555	88
Brecknockshire	1	66	4
Monmouthshire	12	482	52
SCOTLAND	14	338	44
TOTAL	245	6,243	859

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Appendix, Table No. 143.

List of Works having Bessemer Converters in Great Britain in 1869.

No.	——	Number of Converters.	Capacity of Converters. Tons.	Cwt.
1	Henry Bessemer and Company, Sheffield	2	4	—
		1	—	10
2	John Brown and Company, Limited, Sheffield	2	10	—
		2	5	—
		2	3	—
3	Charles Cammell and Company (Limited), Sheffield	6	5	—
4	Weardale Iron Company, Towlaw	4	2½	—
5	J. M. Rowan and Company, Atlas Works, Glasgow	1	3	—
6	Samuel Fox and Company, Deepcar	2	3	—
7	Lloyds, Foster, and Company, Old Park, Wednesbury	2	3	—
8	Bolton Iron and Steel Works, Bolton	4	5	—
9	London and North Western Railway, Crewe	2	3	—
10	Lancashire Steel Company, Gorton	2	6	—
11	Mersey Steel and Iron Works, Liverpool	2	5	—
12	Manchester Steel and Railway Plant Company, Gibraltar Works, Newton Heath, Manchester	4	3	—
13	Barrow Hæmatite Steel Company, Barrow	6	6	—
		4	5½	—
14	The Dowlais Iron Company, Dowlais	6	5	—
15	Ebbw Vale Company, Ebbw Vale	2	5	—
16	Ditto ditto	1	1½	—
17	Bessemer and Sons, Greenwich	2	5	—
18	Workington Iron Works, Workington	—	—	—

Bessemer Works in other Countries, 1868.*

In United States of America	7 works.
„ France	5 „
„ Belgium	1 „
„ Prussia	7 „
„ Austria	10 „
„ Sweden	12 „
„ Russia	1 „
„ India	1 „

* On the authority of a work on Bessemer steel issued with the sanction of the Iron and Steel Association of the United States. Corroborated by Mr. Henry Bessemer.

Appendix, Table No. 143 *a*.

Exports and Imports of Iron according to the Returns of the Board of Trade for the three years ending 1869.

EXPORTS.

Description of Iron, &c.	Quantities. 1867.	1868.	1869.	Declared Value. 1867.	1868.	1869.
Iron—	Tons.	Tons.	Tons.	£	£	£
Pig and Puddled	565,612	552,999	711,612	1,645,788	1,582,391	2,056,605
Bar, Angle, &c.	301,428	302,624	357,604	2,344,549	2,285,187	2,268,071
Railroad	580,571	583,488	895,848	4,861,129	4,660,612	7,282,040
Wire (not telegraph)	19,406	21,780	28,751	382,301	421,618	435,778
Castings	81,531	85,504	106,472	667,254	700,661	857,643
Hoops, Sheets, and Boiler Plates	146,188	150,231	195,670	1,817,228	1,809,320	2,253,600
Wrought of all sorts	107,944	121,480	134,113	2,078,697	2,189,960	2,427,154
Old, for re-manufacture	47,285	95,263	118,803	187,831	377,307	483,510
Steel—Unwrought	32,685	31,362	33,530	1,065,614	1,009,342	1,038,800
Total	1,882,650	1,944,731	2,577,493	15,050,391	15,036,398	19,519,201

IMPORTS.

Description of Iron, &c.	Quantities. 1867.	1868.	1869.	Value. 1867.	1868.	1869.
	Tons.	Tons.	Tons.	£	£	£
Iron in bars, unwrought	71,703	64,689	68,463	732,875	600,673	622,511
Steel, unwrought	8,636	7,654	10,716	—	—	—
Iron and steel, wrought or manufactured	12,108	12,104	12,381	473,630	434,495	403,078

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APPENDIX, TABLE 144.

CLAY MANUFACTURES.

BRICKS, TILES, PIPES, &c.

The following is a general Summary of the estimated total Quantities produced annually, and the estimated Value thereof, in the Counties named :—

No.	County.	Estimated Quantity of all Kinds manufactured.	Estimated Value of all Kinds at mean Average Market Price.
		Number.	£
1	Cornwall	5,900,000	6,490
2	Devonshire	26,250,000	28,875
3	Dorsetshire	71,500,000	78,650
4	Somersetshire	72,875,000	80,160
5	Gloucestershire	84,500,000	92,950
6	Wiltshire	68,500,000	75,350
7	Hampshire	62,300,000	68,530
8	Isle of Wight	6,750,000	7,425
9	Sussex	77,550,000	85,305
10	Surrey	75,000,000	83,050
11	Kent	65,750,000	72,325
12	Middlesex	107,500,000	118,255
13	Berkshire	42,350,000	46,585
14	Essex	80,000,000	88,000
15	Suffolk	84,000,000	92,400
16	Norfolk	75,000,000	82,500
17	Cambridgeshire	69,000,000	75,900
18	Hertfordshire	27,500,000	30,250
19	Buckinghamshire	35,500,000	39,500
20	Oxfordshire	54,500,000	59,950
21	Bedfordshire	29,000,000	31,900
22	Huntingdonshire	24,750,000	27,225
23	Lincolnshire and Rutland	75,000,000	83,030
24	Northamptonshire	58,250,000	64,075
25	Warwickshire	75,500,000	94,375
26	Leicestershire	54,000,000	67,500
27	Nottinghamshire	64,500,000	80,625
28	Derbyshire	74,000,000	92,500
29	Staffordshire and Worcestershire	100,000,000	125,000
30	Herefordshire	25,000,000	27,500
31	Monmouthshire	58,000,000	72,500
32	Shropshire	55,000,000	68,750
33	Cheshire	60,000,000	75,000
34	Lancashire	108,000,000	129,000
35	Yorkshire	100,000,000	125,000
36	Cumberland and Westmoreland	13,500,000	16,875
37	Durham and Northumberland	96,000,000	120,000
38	South Wales	93,500,000	116,000
39	North Wales	86,250,000	107,000
40	Scotland (part of)	55,000,000	68,750
41	Jersey	5,529,600	6,925
	Total quantity and estimated value of clay manufactures (exclusive of earthenware and porcelain) in Great Britain	2,508,004,600	£2,911,980

Until 1833 an excise duty was charged both on bricks and tiles (the latter being then exempted from the duty), so that their manufacture was placed under surveillance. It was ordered by 17 George III. c. 42, that bricks made for sale should be 8½ inches long, 2½ inches thick, and 4 inches wide, on pain of forfeiting, for bricks of less dimensions when burnt, 20s. for every 1,000, and proportionably for a greater or less number. It was also provided that the size of the sieves or screens for sifting or screening sea-coal ashes, to be mixed with brick earth in making bricks, should not exceed ¼ of an inch between the meshes. The duty was entirely repealed in 1850.

In 1821 the number of bricks, &c., paying duty were				899,178,510
„ 1840	„	bricks only	„	1,677,811,134
„ 1847	„	„	„	2,193,829,491
„ 1849	„	„	„	1,462,767,154

This being the year when the oppressive nature of the duty on bricks was strongly urged, and the repeal expected, many large buildings were delayed, and consequently, as we see, the make of bricks diminished. From 1849 until the present no attempt has been made to determine the value of the manufacture.

WEIGHT OF BRICKS.

Worcester, solid	8¾ lbs.	Machine made.
Do. perforated	6	Do.
Staffordshire, solid	9½ „	Hand made.
London Stock, solid	5¼ „	Do.

A cubic yard of bricks is estimated to contain 384 bricks, and on the average about 373 bricks to the ton.

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APPENDIX, No. 145.

The LICENSES in this country for the use of HOFFMANN'S Brick Kilns, 1870.

	No. of Kilns.	
The Right Honourable the Lords of the Admiralty, *to burn 75 million of bricks*	5	90,000
The Aylesford Pottery Company, Kent (1 single, 1 double)	3	45,000
The Cliff Fire-Clay Company, Crigglestone, near Wakefield	1	12,000
The North London Brick Company, Holloway	1	16,000
The Dorking Grey Stone Lime Company, Surrey	2	50 Tons
The Swan Bank Brick Company, Halifax	1	15,000
Bradford Colliery Company, Manchester	1	12,000
Messrs. Peto, Betts, Kelk, and Waring Brothers, Kensington (2 double Kilns)	4	48,000
Messrs. Waring Brothers, King's Cross, (1 double, 1 single Kiln)	3	30,000
The Avon Bank Brick and Tile Company, Bristol	1	16,000
Messrs. W. Thomas and Company, Wellington, Somerset	1	18,000
Messrs. J. and A. Glover, Longton Staffordshire Potteries	1	15,000
Messrs. R. Beart and Company, Arlsey	1	10,000
Messrs. Bradley and Craven, Wakefield	1	16,000
Messrs. Josh. Cliff and Son, Fire-Clay Works, Wortley, Leeds	2	30,000
Messrs. W. Ingham and Sons, Fire-Clay Works, Wortley, Leeds	1	15,000
Messrs. Longley and Company, Leeds	1	12,000
The Leeds Patent Brick Company, Leeds	1	
Messrs. Platt Brothers and Company, Oldham	1	
Messrs. Keith and Harriman, Aberdeen	1	20,000
Mr. Geo. Furness, Burham, Kent (1 double Kiln)	2	30,000
Mr. Geo Jennings, South Western Pottery, Poole	1	10,000
Mr. W. Hicks, Barnet, Herts	1	12,000
Mr. O. Wilson, Malvern	1	12,000
Mr. W. Mansfield, Birmingham	1	10,000
Mr. T. Bennett, Derby	1	15,000
Mr. E. Dusautoy, Derby	1	
Mr. E. Ensor, Woodville Fire-Clay Works, Burton-on-Trent	1	20,000
Mr. R. Beart, Huntingdon	1	
Mr. R. W. Hunt, Otley	1	10,000
J. Hancock, Exeter	1	18,000
J. Hartley, Castleford, Yorkshire	1	12,000
H. Greensmith, Harrowgate	1	
Briggs and Son, Normanton, Yorkshire	1	20,000
Eare Vale, Leahorn Colliery	1	18,000
Oval Wood, Lasswade, Scotland	1	15,000
Rob. Small, Dundee	1	
Mr. J. Saner, Hull	1	12,000
Mr. W. Benson, Newcastle-on-Tyne	1	
Mr. A. J. Woodhouse, Barrow-in-Furness	1	20,000
Mr. W. Barry, Scarborough	1	10,000
Mr. John Moore, Belfast, (1 double kiln)	2	20,000
Mr. R. Murland, Castle Espie Lime Works, County Down	2	90 Tons
Messrs. Burgass and Gripper, Nottingham	3	45,000
The Merryflats Brick Company, Glasgow	1	10,000
The Rochdale Brick and Tile Company	1	15,000
Robert White, Esq., Sheffield	1	20,000
Messrs. Raynes, Lupton, and Company, Llandulas	1	70 Tons
The Patent Brick Company, Bradford	1	15
Messrs. Browne and Company, Bridgewater	1	18,000
The Brymbo Iron Company, Wrexham	1	
The Minera Lime Company, Wrexham	2	80 Tons
The Patent Brick Company, Huddersfield	1	
M. Arthur S. Hobby, Kington, Hereford	2	20,000
The Bishop Waltham Clay Company	1	12,000
Mr. J. Howl, Tipton	1	12,000
Messrs. Clark and Wilson, Settle Lime Works, Yorkshire	1	60 Tons
Messrs. F. T. T. Lisle, West Hartlepool	1	8,000
Messrs. Redway and Carter, Exmouth	1	10,000
Boston Lime Company, Dublin	1	30 Tons
South Elnsall Lime Company, near Leeds	1	30 Tons
D. W. Barker, Worcester	1	12,000
C. Waddell, Lurgan, Ireland	1	
W. W. Clarkson, Leicester	1	20,000
H. Johnson, Lowestoft	1	8,000
McGurns, Strabane, Ireland	1	40 Tons
Oxford Berks Brick Company	1	10,000
Bowkes, Peake and Bird, London	1	12,000
Messrs. Woodhead, Eccleshill, Yorkshire	1	
Messrs. Woodhead, Shipley, Yorkshire	1	
Martin Brothers, Plymouth	1	20,000
Eleazer Rothwell, Edgeworth, near Bolton	1	12,000
Ed. Johnson, Manchester	1	20,000
Indian Government	6	
Madras	1	
Victoria Brick Lime Company, Melbourne	1	
Messrs. Beart and Company, Cambridge	1	

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APPENDIX, TABLE No. 146.

RETURNS of COAL USED, and ESTIMATE of Coal employed, for the PRODUCTION of STEAM POWER, and for other purposes, in the Manufactories of the UNITED KINGDOM.

ENGLAND.

(1.) CHESHIRE.

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements manufacture.	9	4	4	3	14	130	133	50	—	Smiths, Stockport and Staffordshire.
Alkali manufacture -	1	1	13	45	—	—	17,252	—	—	Wigan.
Bleachers - - -	7	5	82	391	710	11,910	14,282	—	—	Engine, Yorkshire.
Bone crushers - -	3	2	1	10	12	300	420	—	—	Slack.
Brass founders - -	25	12	11	60	75	1,798	609	175	—	Furnace, smithy, Wigan, Stafford.
Brewers - - -	26	12	8	29	20	1,067	888	20	—	Engine, South Wales, Stafford.
Brick and tile manufacturers	51	28	10	120	14	591	13,385	—	—	Slack, Lancashire, Welsh.
Cement maker - -	5	1	1	—	8	41	6	—	—	
Colour maker - -	2	1	1	8	10	127	—	—	—	Burgy.
Cotton manufacture -	56	36	128	5,157	15,278	80,447	2,194	—	—	Burgy, engine, cannel.
Cotton spinners - -	58	33	107	3,665	12,862	62,957	357	15	—	Burgy, engine, Yorkshire.
Drain pipe manufacture -	3	3	1	—	12	150	400	—	—	
Dyers - - -	8	4	2	16	40	1,400	21	—	—	Staffordshire and Blackburn.
Engineers - - -	30	15	25	347	607	8,346	4,443	632	—	Engine, furnace, Welsh, Lancashire.
Iron founders - -	19	9	4	27	63	1,043	654	14	—	Slack, small, Black Mine.
Lime burners - -	2	2	1	8	—	156	52	—	—	Holehouse, Redga and Great Mine.
Machine makers - -	24	8	8	55	78	864	171	18	—	Slack, Staffordshire.
Maltsters - -	20	11	3	8	21	293	104	174	—	Lancashire.
Manure manufacture -	6	5	3	32	30	1,775	62	—	—	Lancashire and slack.
Printers - - -	23	11	59	489	508	22,920	3,950	—	—	Engine, steam, cannel, Burgy.
Railway waggon manufacturer.	3	1	—	—	—	—	24	—	—	Slack.
Ribbon manufacture - -	11	4	1	8	—	170	—	—	—	
Saw mills - - -	10	6	6	88	82	1,510	180	—	—	Slack, Black Mine.
Silk manufacturers and trowsters.	154	60	47	536½	686	18,028	806	—	—	Slack, engine, Stafford and Cheshire.
Woollen manufacture -	10	6	4	70	20	2,004	14	—	—	Engine, slack, Black Mine.
Worsted manufacture -	2	1	—	—	—	—	20	—	—	Slack.
Total for Cheshire -	568	281	580	11,172½	31,150	218,022	60,377	1,098	—	

Total number of circulars issued - - - 568
" " *returned* - - - 281

Leaving the Coal for two hundred and eighty-seven works to be estimated.

	Tons.
COAL returned as used for steam engines - - - - - - -	218,022
" " for other purposes - - - - - -	60,377
COKE used computed as Coal - - - - - - -	1,756
Total - - - - - - -	280,155
COAL *estimated* as used by steam engines, not returned - - - - -	*129,000*
" " for other purposes - - - - - -	*61,000*
Total Coal used in the manufactures (other than PIG and MALLEABLE IRON, and SALT WORKS,) of CHESHIRE - - - -	470,155

(2.) CUMBERLAND.

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement manufacturers.	11	5	1	12	—	218	91	136	—	
Anchor makers - -	3	1	—	—	—	—	54	—	—	Smiths' coal.
Bone crushers - -	1	1	1	6	—	—	104	—	—	
Brass founders - -	12	7	7	90	60	1,792	1,325	516	—	
Brewers - -	38	19	10	22	51	1,857	1,115	142	—	
Brick and tile makers -	25	10	5	87	35	1,399	1,908	1,239	—	Whitehaven, nuts.
Color makers - -	1	1	—	—	—	—	210	—	—	Smalls.
Cotton manufacturers -	9	6	8	250	298	6,147	1,508	—	—	Slack, dust, and nuts.
Dyers - - -	8	4	13	486	917	13,996	458	—	—	Slack, nuts.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Earthenware manufacturers	3	1	1	25	50	520	2,642	—	—	Round, small.
Engineers	16	6	19	36	948	2,444	1,028	290	—	Dust, small.
Flax spinners	7	4	6	125	255	3,646	400	—	—	Small.
Iron founders	3	3	2	4	3	45	25	55	—	South Durham.
Lime burners	10	5	—	—	—	—	723	40	—	Steam.
Linen manufacturers	3	1	1	12	16	300	172	—	—	Bleach house.
Machinists	7	2	—	—	—	—	52	—	—	
Maltsters	9	2	—	—	—	—	—	15	—	
Millwrights	7	2	1	—	1	26	4	—	—	
Printers	12	4	2	23	25	590	7	—	—	Nuts, large, small.
Saw mills	7	2	2	15	20	160	—	—	—	Small.
Steam boiler manufacturers	1	1	1	—	8	182	12	—	—	Small.
Thread makers	3	2	3	96	250	3,720	—	—	—	Small.
Tool makers	4	2	—	—	—	—	5	—	—	Small.
Woollen manufacturers	11	5	2	38	50	1,491	5	63	—	Nuts.
Worsted manufacturers	2	2	1	25	78	800	60	—	—	Fine slack.
Total for Cumberland	213	98	86	1,352	3,065	38,823	11,908	2,496	—	

Total number of circulars issued - - - 213
" " *returned* - - - 98

Leaving the Coal for one hundred and fifteen works to be estimated.

	Tons.
Coal returned as used for steam engines	38,823
" " for other purposes	11,908
Coke used computed as Coal	3,495
Total	54,226
Coal *estimated* as used by steam engines, not returned	*17,500*
" " for other purposes	*11,475*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Cumberland	83,201

(3.) DERBYSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Barytes manufacturers	51	4	3	30	—	300	1,472½	—	—	Cobbles, slack, soft.
Baths	4	3	—	—	—	—	185	—	—	Kilburn, cobbles, slack.
Bedstead maker	1	1	—	—	—	—	—	—	—	
Bleachers	13	8	4	139	—	685	6,176	—	—	Slack, cobbles.
Bobbin manufacturers	4	4	3	24	—	368	7	—	—	Slack, cobbles.
Boiler (steam) manufacturers.	5	1	1	4	—	100	100	—	—	Kilburn, hard and soft.
Brass founders	15	5	2	14	10	376	130	195	—	Kilburn, soft, &c.
Brick manufacturers	64	38	13	101	25	3,171	23,093	—	—	Kilburn, cobbles, slack, hard, soft.
Brewers	29	11	8	48	—	1,639	835	—	—	Cobble, slack, soft, Derbyshire.
Calico printers	5	4	24	235	—	17,202	129	—	—	Engine coal.
Candle wick makers	6	—	—	—	—	—	—	—	—	
Cement manufacturers	6	3	3	70	10	3,310	450	—	—	Kilburn, cobbles, slack.
Chain manufacturers	2	2	2	14	—	36	49	—	—	Cobbles, slack, Second Main Mine.
Chemists, manufacturers	15	9	6	37	26	567	2,417	—	—	Cobbles, slack, Tapton, Kilburn.
Color manufacturers	4	2	1	5	7	110	35	—	—	Slack, Kilburn.
Contractors	16	4	1	6	—	50	109	—	—	Derbyshire.
Cotton band manufacturers	9	5	7	82	100	1,588	68	—	—	Engine, small, Little Mine.
Cotton doublers	5	3	5	140	470	4,045	—	180	—	Slack and Deep Main Mine.
Cotton handkerchief manufacturers.	21	16	45	1,261	2,717	34,515	868½	—	—	Slack, Burgy, Silkstone.
Cotton spinners	12	11	18	702	395	12,065	1,511	100	—	Slack, cobbles, Yorkshire.
Drain pipes	2	2	4	66	—	2,900	9,440	—	—	Cobbles, hard.
Dyers	4	2	2	9	—	525	5	—	—	Cobbles, Kilburn, Marehay.
Earthenware manufacturers	17	13	6	80	90	1,950	25,000	—	—	Slack, cobbles, potters'.
Elastic web manufacturers	17	11	12	144	—	1,958	75	—	—	Slack, cobbles, Byefield House.
Engineers	28	6	43	2,110	2,659	39,735	68,009	—	—	Slack, cobs, nuts, hard, soft.
Gimp manufacturers	3	1	1	16	—	288	28	—	—	Nuts and best.
Grease manufacturers	3	1	—	—	—	—	20	—	—	Cobbles.
Hosiery manufacturers	9	5	1	12	14	324	300	—	—	Slack, furnace.
Iron founders	10	4	13	345	304	8,645	33,798	141½	—	Slack.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Lace manufacturers -	24	9	4	67	56	1,507	47	16	—	Slack, cobbles.
Lime burners - -	12	6	6	212	—	2,372	60,354	—	—	Slack, kiln coal.
Maltsters - - -	70	25	8	26	—	497	343½	306	—	Slack, anthracite, &c.
Millers - - -	157	26	22	257	32	5,622	835	680	—	Slack, cobbles, dust, &c.
Newspapers - -	16	13	9	25½	—	394	137½	—	—	Slack, cobbles, Kilburn.
Paper makers - -	9	6	18	318	322	7,308	635	—	—	Slack, cobbles.
Printers - -	9	3	—	—	—	—	24	—	—	Ditto.
Saw mills - -	8	5	3	53	25	1,170	92	—	—	Top, hard, black, shale, slack.
Silk manufacturers, &c. -	24	18	20	381	27	6,481	374	5	—	Slack, cobbles, hard.
Stocking manufacturers -	6	1	—	—	—	—	10	—	—	Swanwick coal.
Tallow manufacturers -	21	12	1	25	40	486	696	—	—	Cobbles, soft, hard.
Woollen manufacturers -	2	2	—	—	—	—	40	—	—	Steam coal.
Total of Derbyshire -	733	305	319	7,058½	7,329	162,284	237,898	1,623½	—	

Total number of circulars issued - - - 733
„ „ *returned* - - - 305

Leaving the Coal for four hundred and twenty-eight works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	162,284
„ „ for other purposes - - - - - -	337,898
Coke used computed as Coal - - - - - -	2,596
Total - - - - - - -	502,778
Coal *estimated* as used by steam engines, not returned - - - - -	*214,000*
„ „ for other purposes - - - - - -	*333,412*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Derbyshire	1,050,190

(4.) PLYMOUTH.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Candle, soap and coal manufacture - -	—	—	10	86	—	1,600	40	343	—	Welsh.
Cement and saw mills -	—	—	11	188	—	1,185	890	—	—	Welsh, Hull or Yorkshire, steam.
Chemical works - -	—	—	4	61	—	575	1,000	—	—	Welsh and steam.
Brewers - -	—	—	5	33	—	588	183	—	—	Steam, Welsh, Hull, Rhondda.
Printers - -	—	—	2	7	—	80	11	—	—	Welsh.
Refiners - - -	—	—	19	167	—	8,830	2,067	—	—	Welsh.
Soda Water manufacture	—	—	2	3	—	24	5	—	—	Newport and Hull or Yorkshire.
Miscellaneous - -	—	—	5	48	—	507	305	—	—	Welsh.
Total for Plymouth	50	32	58	593	—	13,339	4,501	343	—	

Total number of circulars issued - - - 50
„ „ *returned* - - - 32

Leaving the Coal for eighteen works to be estimated.*

	Tons.
Coal returned as used for steam engines - - - - - -	13,339
„ „ for other purposes - - - - - -	4,501
Coke used computed as Coal - - - - - -	480
Total - - - - - -	18,320
Coal *estimated* as used by steam engines, not returned - - - - -	*950*
„ „ for other purposes - - - - - -	*1,500*
Total Coal used in the manufactures, of Plymouth - - - -	20,770

* The returns in this instance were obtained with the assistance of the police.

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(5.) DURHAM.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Anchor and chain makers	7	4	7	—	—	930	9,813	180	—	Small, unscreened.
Bleachers	8	—	—	—	—	—	—	—	—	
Bottle makers	9	7	—	—	—	930	67,912	—	—	Duff, dust, and small coal.
Brass founders	8	4	—	—	—	510	32	52	—	Small, round, and nuts.
Brickmakers	6	2	—	—	—	—	129	—	—	Small and splints.
Cement	3	1	9	—	—	6,239	3,547	14,600	—	Small coal, Durham Collieries.
Coppersmiths	6	2	14	—	—	156	312	277	—	Vane and Hetton Collieries.
Fire bricks, &c.	25	9	11	—	—	4,709	24,660	—	—	Small, unscreened, and stone coal.
Earthenware	6	6	7	50	—	3,066	29,610	—	—	
Glass	9	8	5	40		1,065	58,640	5,799	—	Small, duff, dust, &c., Hartley Collieries.
Glue	3	2	—	—	—	255	—	14	—	Splints, thirds, South Durham.
Grease	5	2	1	—	—	45	176	—	—	Rough, small, and seconds.
Lead works	1	1	2	—	—	344	35	—	—	Steam coal, South Durham.
Lime burners	11	8	3	—	—	1,050	21,398	1,530	—	Small coal, Wearmouth and Unsworth.
Rope manufacturers	12	3	4	—	—	1,700	88	—	—	Small coal, Ravensworth Colliery.
Saw mills	8	3	4	—	—	1,913	—	—	—	Dust, small and unscreened.
Smelt mills	1	1	—	—	—	100	3,800	—	—	
Steam engine makers	15	7	45	804	—	43,186	6,157	4,429	—	Small and steam coal Seaton and Penshaw.
Steel manufacturers	2	1	—	—	—	—	500	—	—	Unscreened.
Stuff manufacturers	1	1	3	—	—	3,630	—	—	—	Nuts, South Durham Colliery.
Wire rope makers	4	1	1	—	—	330	—	—	—	
Worsted manufacturers	3	2	—	—	—	—	45	30	—	
Total of Durham	148	70	116	894	—	70,158	226,849	26,911	—	

Total number of circulars issued - - 148
" " *returned* - - 70

Leaving the Coal for seventy-eight works to be estimated.

	Tons.
Coal returned as used for steam engines	70,158
" " for other purposes	226,849
Coke computed as Coal	37,675
Total	334,682
Coal *estimated* as used by steam engines, not returned	*54,500*
" " for other purpose	*156,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Durham	545,182

(6.) ESSEX.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement makers.	21	12	10	98	175	1,237	974	831	—	Tanfield, Newcastle, and Yorkshire.
Brewers	76	27	10	31	44	1,311	3,159	110	—	Welsh steam, Hucknall: Newcastle, Hartley, Sunderland, slack and cobbles.
Brick and tile makers	68	38	6	90	86	1,108	6,851	873	—	Seconds, nuts, hard, Tanneld, Hartley, and Portland.
Distillers	1	1	3	70	—	4,071	331	—	—	Best coal.
Engineers	29	7	7	74	48	2,994	1,011	175	—	Hard, steam, Newcastle, Yorkshire and Walls End.
Lime burners	2	1	—	—	—	—	70	—	—	Welsh small coal.
Maltsters	68	32	5	20	29	742	7,703	99	—	Cobbles, small, anthracite, and silkstone.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Millers	78	34	21	158	191	2,670	425	66	—	Steam, hard, small, household, Newcastle, Staveley, and Derbyshire.
Printers	6	1	—	—	—	—	10	—	—	
Saw mills	4	4	4	20	18	393	—	—	—	Dust, small, Newcastle, and Yorkshire.
Silk manufacturers	6	3	1	8	—	50	44	151	—	West Hartley and Newcastle.
Tar distillers	6	2	2	11	—	343	—	—	—	Hard, steam, and creosote employed.
Total of Essex	360	162	69	580	591	14,919	20,578	1,805	—	

Total number of circulars issued - - 360
„ „ *returned* - - 162

Leaving Coal for one hundred and ninety-eight works to be estimated.

	Tons.
Coal returned as used for steam engines	14,919
„ „ for other purposes	20,578
Coke computed as Coal	2,581
Total	38,078
Coal *estimated* as used by steam engines, not returned	*12,750*
„ „ for other purposes	*25,000*
Total Coal used in the manufactures of Essex	75,828

(7.) GLOUCESTERSHIRE (not including BRISTOL).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	2	1	1	—	—	180	210	—	—	Welsh and Forest of Dean.
Brewers	2	2	2	—	—	200	894	—	—	
Brickmakers	15	10	2	12	—	500	3,235	—	—	Principally Forest of Dean.
Engineers	5	1	2	72	—	1,165	—	—	—	Cannock Chase.
Iron masters	3	—	—	—	—	—	—	—	—	
Marble works	1	—	—	—	—	—	—	—	—	Works discontinued.
Railway carriage	1	1	2	—	—	1,515	—	5,553	—	Welsh and Staffordshire.
Pin manufacture	3	1	—	—	—	—	30	—	—	Norchard coal.
Woollen cloth	21	20	28	81	—	21,536	2,896	—	—	Principally Forest of Dean and South Wales.
Woollen flock	7	6	10	—	—	3,078	725	40	—	Small steam coal, Forest of Dean.
Silk throwsters	3	2	1	—	—	25	220	—	—	Do. do. do.
Sundry manufactures	6	—	—	—	—	—	—	—	—	No replies.
Total of Gloucestershire	69	44	48	165	—	28,199	7,710	5,593	—	

Total number of circulars issued - - 69
„ „ *returned* - - - 44

Leaving the coal for twenty-five works to be estimated.

	Tons.
Coal returned as used for steam engines	28,199
„ „ for other purposes	7,710
Coke computed as Coal	7,830
Total	43,739
Coal *estimated* as used for steam engines	*10,500*
„ „ for other purposes	*3,500*
Total coal used in manufacture (other than Pig and Malleable Iron) in Gloucestershire	57,739

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(8.) BRISTOL (GLOUCESTERSHIRE).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used; Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Anchor and chain	3	1	1	—	—	250	540	—	—	Wales and Gloucestershire.
Brewers	5	3	3	—	—	407	1,863	29	—	Steam, Rubble, and Anthracite.
Brickmakers	12	5	5	—	—	8,110	3,060	9,641	—	Small brush; Kingswood, Easton, and Whitehall colleries.
Cotton manufacturers	1	1	19	—	—	9,676	—	—	—	Welsh coal.
Cement	4	1	1	—	—	84	84	—	—	
Engineers	14	6	13	—	—	3,008	11,578	218	—	Small, screenings, Welsh, and Gloucester.
Flax spinning	3	3	4	—	—	1,971	—	—	—	Brush for kilns, small for steam.
Glass bottles	4	2	2	—	—	535	9,171	—	—	Brush and small coal.
India rubber	—	—	—	—	—	—	—	—	—	Branch only.
Iron manufacturers	2	2	2	—	—	310	880	—	—	Small engine coal.
Iron founders	1	1	3	—	—	1,800	2,663	1,025	—	Welsh and Gloucester coal.
Metal smelters	1	1	1	—	—	—	1,740	265	—	Small coal, Easton colliery.
Rolling mills	1	1	1	—	—	350	1,750	—	—	Small coal.
Steam mills	1	1	2	—	—	15	620	—	—	Welsh coal.
Sugar refiners	6	4	42	—	—	46,551	7,676	—	—	Furnace, mixed, Duffryn, and Gloucester.
Total of Bristol	58	32	99	1,049	4,211	73,067	41,625	11,178	—	

Total number of circulars issued - - - 53
" " *returned* - - - 32

Leaving the Coal for all the other works to be estimated.*

	Tons.
Coal returned as used for steam engines	73,067
" " for other purposes	41,625
Coke used computed as Coal	15,650
Total Miscellaneous Returns and Estimates	130,342
Coal *estimated* as used by steam engines	*58,262*
" " for other purposes	*142,786*
Total coal used in the manufactures (other than Pig and Malleable Iron) of Bristol	331,390

* Personal applications were made in the majority of cases, and much information furnished by gentlemen intimately connected with the trade and manufactures of the city.

(9.) HERTFORDSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brewers	62	22	9	68	—	2,693	1,498	7	306	Cobbles, hard steam, Wigan, Derby, Tanfield, and Welsh.
Brick and tiles	28	15	2	9	—	8	3,028	65	—	Nuts, hards, cobbles, Derby, Leicester, and Lancashire.
Drain pipes	3	1	—	—	—	—	52	—	—	Small coal.
Ironfounders	17	6	5	22	12	89	266	33	—	Hard, steam, Tanfield, Leicester, and Durham.
Lime burners	9	5	—	—	—	—	520	39	—	Hard, small, Staveley, and Tanfield Moor.
Maltsters	26	9	—	—	—	—	—	—	478	Principally Welsh.
Millers	40	13	2	18	—	50	91	—	—	Wallsend, Silkstone, &c., water-power principally employed.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Newspapers -	8	4	1	2	—	3	10	—	—	Hand power generally employed.
Saw mills - - -	3	3	3	58	—	400	43	—	—	Cobbles, &c., Tanfield, Babbington.
Silk manufacturer	3	2	3	59	—	827	49	8	—	Merthyr and Aberdare.
Total -	199	80	25	236	12	4,070	5,557	152	784	

Total number of circulars issued - - - 199
„ „ *returned* - - 80

Leaving the Coal for one hundred and nineteen works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	4,070
„ „ for other purposes - - - - - -	5,557
Coke computed as Coal - - - - - - -	213
Anthracite - - - - - - -	784
Total - - - - -	10,624
Coal *estimated* as used by steam engines, not returned - - - - -	*4,500*
„ „ for other purposes - - - - - -	*5,750*
Total Coal used in the manufactures of Hertfordshire - - - -	20,874

(10.) KENT.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Baths - - -	16	9	1	4	—	69	241	106	—	Furnace, small, and household.
Brass founders - -	13	6	6	34	—	314	332	76	—	North country coal, Blyth, &c.
Brewers - - -	106	61	44	279	—	6,038	3,176	1,863	—	Furnace, house, steam, Newcastle, Blyth, Hartley's, and Midland coals.
Brick and tile makers -	112	49	32	770	622	4,394	38,307	856	—	Small, furnace, hard, North country, Tanfield, and Scotch coal.
Cement - - -	6	2	3	63	85	1,382	4,686	1,272	—	Small coal, Wylam.
Engineers - - -	28	14	24	228	368	3,091	7,397	430	—	Steam, forge, smiths', and Newcastle.
Jam manufacturers -	2	1	—	—	—	—	25	97	—	
Linen - - -	3	3	1	10	—	30	5	—	—	Steam coal.
Maltsters - - -	20	14	2	5	12	389	—	96	461	Principally Welsh coal.
Millers - - -	64	23	12	90	136	2,280	214	21	—	Small, house, Wallsend, and Newcastle.
Saw mills - - -	8	8	7	24	47	523	164	78	—	Small, screenings, house, Welsh, and Newcastle.
Printers - - -	36	17	3	4	4	16	1,427	13	—	House, Blyth, and Wallsend.
Seed crushers - -	8	4	5	114	285	5,195	176	—	—	Blyth and Hartley.
Total - -	422	211	140	1,625	1,509	23,721	56,150	4,908	461	

Total number of circulars issued - - - 422
„ „ *returned* - - - 211

Leaving the Coal for two hundred and eleven works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	23,721
„ „ for other purposes - - - - - -	56,150
Coke used computed as Coal - - - - - -	6,872
Anthracite - - - - - - -	461
Total - - - - - - -	87,204
Coal *estimated* as used by steam engines, not returned - - - - -	*20,000*
„ „ for other purposes - - - - - -	*50,000*
Total Coal used in the manufactures of Kent - - - - -	157,204

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(11.) LANCASHIRE (LIVERPOOL and MANCHESTER *not included*).

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
				Nominal.	Indicated.	Tons.	Tons.	Tons.	Tons.	
Agricultural implements	12	6	3	22	—	595	203	—	—	Wigan and Arley Mine.
Alkali	4	1	3	15	—	14,560	—	—	—	Slack.
Ammonia	2	1	1	10	14	1,000	98	—	—	Burgy.
Anvil makers	1	1	2	13	—	643	676	—	—	Smithy and Trencherbone.
Baize manufacture	2	2	8	255	509	3,616	3,170	—	—	Burgy and Wigan.
Baths, &c.	21	10	2	15	—	204	710	36	—	Steam coal and coal from Durham and Rochdale.
Barytes, &c.	2	2	1	6	—	936	—	—	—	Slack from Pemberton.
Bedding manufacture	1	1	—	—	—	—	4	—	—	Black Mine.
Bedstead manufacture	2	1	—	—	—	—	—	—	—	All hand labour.
Bell founders	1	1	1	2	—	6	6	12	—	Slack.
Blankets	6	1	2	36	—	1,000	100	—	—	Burgy.
Bleachers	29	14	52	898½	1,064	42,749	4,547	—	—	Burgy, Ringley, Wigan, Mountain Mine, and steam coal.
Bobbin manufacture	20	10	6	77	90	1,433	638	—	—	Cannel, Black Mine, and Trencherbone.
Bone grinders	4	3	1	6	—	140	—	—	—	Burgy; the other two use water power only.
Bolt makers	28	13	9	59	—	949	553	70	—	Mountain Mine, Black Mine, Wigan, smithy and steam coal.
Bottle manufacture	5	4	1	3	—	56	13,102	—	—	St. Helen's, Main Delph, Blend, and Yard Mine.
Brass founders	84	54	73	878	1,651	25,024	2,551	6,353	—	Burgy, Wigan, Arley Mine, Mountain Mine, Artherton Mine, Pemberton, Riley, Black Mine, Lancashire, and smithy coals.
Brewers	100	48	43	255	58	12,102	4,579	79	—	Wigan, Burgy, Blend, Pemberton, Black Mine, Butterstaffe, Arley Mine, Birkenhead, Lancashire, and steam coal.
Brick makers	100	47	47	516	148	19,800	38,522	—	—	Burgy, Wigan, Trencherbone, Welsh, Rushby Park, Mountain Mine, and steam coal.
Chain makers	5	3	—	—	—	—	43	—	—	Arley Mine, Little Delf, and slack.
Charcoal manufacture	2	2	2	20	24	430	1,152	—	—	Burgy.
Chemists (manufacturing)	38	16	29	303	438	35,083	24,672	—	—	Burgy, St. Helen's, Blend, Wigan, Trencherbone.
Cotton manufacturers	655	338	607	17,078	40,321	522,317	24,910	551	—	Burgy, Wigan, Baxenden, Tyldesley, Oldham, Burnley, Cannel, Marsden, Black Mine, Arley, Butterworth, Royley, Bacup, Townley, Mountain Mine, steam and smithy coal.
Cotton spinners	562	343	584	18,798	64,102½	489,950	8,048	—	—	Black Mine, Oldham, Burgy, Wigan, Morley Mine, Royley, Trencherbone, Atherton, Arley Mine, West Leigh, Cannel, Orrell, Riley Mine, and steam coal.
Cotton printers	11	9	38	538½	880	18,451	800	—	—	Burgy and Wigan.
Cotton cloth	7	2	2	60	240	2,153	—	—	—	Slack.
Cotton gin	1	—	—	—	—	—	—	—	—	
Cotton waste	10	6	5	75	—	1,784	12	—	—	Soft and steam coal.
Copperas, &c.	3	2	1	2	—	960	—	—	—	King coal.
Counterpane manufacture	10	6	—	—	—	—	15	—	—	Burgy. No steam power employed.
Distillers	4	2	2	21	—	194	—	—	—	Steam coal from Haydock colliery.
Drain pipes, &c.	10	6	6	103	61	4,250	9,190	—	—	Blend, St. Helen's Main, Trencherbone, and steam coal.
Drill manufacturers	5	5	6	107	106	3,276	29	—	—	Burgy.
Dye-wood grinders	4	2	7	210	—	4,497	1,650	—	—	Burgy.
Dyers	68	27	55	775½	1,175	42,742	2,090	—	—	Burgy, Mountain Mine, Wigan, steam.
Earthenware	2	1	1	4	—	84	780	—	—	St. Helen's Main delf.
Engineers	86	48	118	2,944	966	40,835	47,884	626	—	Burgy, Oldham, Wigan, Mountain Mine, steam, and smithy.
Engineer tools	3	—	—	—	—	—	—	—	—	
Fabric manufacture	2	2	8	123	260	2,464	359	—	—	Arley Mine, Burnley.
Finishers	8	3	2	50	70	1,429	142	—	—	Rochdale.
Flax spinners	4	4	7	225	945	7,783	657	—	—	Burgy, Pemberton, Dukinfield.
Flannel manufacture	45	24	23	525	764	14,023	1,100	—	—	Burgy, Wigan, Mountain Mine, steam coal.
Gingham manufacture	7	—	—	—	—	—	—	—	—	
Glass manufacture	7	5	4	41	12	3,956	17,380	—	—	Slack.
Grease manufacture	—	1	—	—	—	—	—	—	—	Returned blank.
India-rubber	5	3	6	6	—	780	22	—	—	Slack.
Iron founders	70	38	58	786	919	2,674	91,532	1,427	—	Burgy, Lignite, Wigan, Haydock, Rushy Park, Bent Mine, and smithy coal.
Iron forgers	1	1	3	24	36	502	1,159	—	—	Furnace mine coal.
Iron ship builders	3	—	—	—	—	—	—	—	—	
Jaconet manufacture	2	2	5	125	584	3,940	—	—	—	Burgy.
Lime burners	14	8	2	14	—	10,570	31,130	2,263	—	Burgy, steam.
Linen manufacture	3	2	1	15	45	420	—	—	—	Barnsley engine coal.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Lock manufacture	3	3	--	—	—	—	278	—	—	Wigan.
Loom makers	3	2	2	25	25	--	—	—	—	
Machine makers	46	17	16	182	89	8,206	1,004	—	—	Burgy, Black Mine, steam, and smithy.
Maltsters	30	14	5	18	—	100	137	212	—	Wigan, Loughton, and Preston.
Manure manufacture	10	4	4	46	—	402	417	—	—	Wigan, Pemberton.
Millers	140	64	56	1,077	827	32,432	492	83	—	Cliviger coal, Burgy, Wigan, steam.
Millwrights	15	4	4	15	26	506	84	66	—	Marsden coal.
Mousselin de Laine	4	1	—	—	—	—	—	—	—	
Mordant manufacture	5	3	—	—	—	—	160	—	—	
Muslin manufacture	7	5	5	120	345	3,560	3	—	—	Burgy.
Nankeen manufacture	5	1	1	10	—	—	—	—	—	Not working in 1867.
Naphtha manufacture	1	—	—	—	—	--	—	—	—	
Newspapers	50	20	12	44½	18½	633	168	75	—	Wigan, Burgy, Pemberton.
Oil manufacture	3	3	5	58	—	600	5,042	—	—	Cannel coal.
Paint manufacture	3	2	—	—	—	—	12	—	—	
Packers	4	—	—	—	—	—	—	—	—	
Paper manufacturers	24	14	74	1,132	804	45,004	7,508	—	—	Burgy, King, Lancashire, Yorkshire, Cannel, steam, Wigan.
Pin manufacture	2	1	2	35	--	969	559	—	—	Pemberton.
Plate glass	4	4	26	934	2,891	19,871	154,279	—	—	St. Helen's, Blend.
Potters	5	1	—	—	--	—	260	—	—	
Printers	84	42	11	39	6	794	541	—	—	Great Mine, Roger Mine, Wigan, Burgy, Rowley, steam.
Quilt manufacture	11	7	5	65	18	2,004	32	—	—	Burgy, Trencherbone.
Railway waggons	7	4	5	62	30	1,775	391	400	—	Burgy.
Roller makers	12	2	2	—	—	—	—	--	—	
Saw mills	38	23	29	355	217	5,566	409	--	—	Burgy, Wigan, Ashton-under-Lyne, St. Helen's, Rushy Park, Pemberton.
Sheet manufacture	2	--	—	—	—	—	—	—	—	
Ship builders	10	6	2	37	30	346	401	—	—	Wigan, smithy.
Silk manufacture	8	7	5	97	148	2,313	180	—	—	Burgy, Wigan, Worsley.
Silk spinners	3	2	4	136	325	3,050	770	—	—	Burgy.
Silk throwers	1	—	—	—	—	—	—	—	—	
Small ware manufacture	4	3	2	36	20	850	—	—	—	Burgy.
Smelt manufacture	1	—	—	—	—	—	—	—	—	
Spindle and fly manufacture	30	13	12	124½	101	3,580	657	—	—	Burgy, Ringley, Pemberton, smithy
Soap manufacture	10	6	15	60	—	6,570	20	—	—	Hapton Valley.
Steam boilers, &c.	19	9	10	98	43	214	932	—	—	Pemberton, Rowley, Burgy, Wigan.
Steel manufacture	4	3	17	600	—	3,515	25,432	—	—	Wigan, Burgy.
Stone ware	2	—	—	—	—	—	—	—	—	
Stove range	6	2	—	--	—	—	28	—	—	
Stuff manufacture	2	2	1	5	8	267	--	—	—	
Sugar refiners	1	1	4	51	98	1,000	4,961	—	—	Burgy and cannel.
Tallow manufacture	24	8	6	23	--	379	132	—	—	Burgy.
Terra cotta	5	4	2	32	—	1,512	960	—	—	Burgy, Mountain Mine.
Temple manufacture	4	1	—	—	—	—	--	—	—	Power rented.
Washing machines	6	2	2	15	—	98	20	—	—	Burgy.
Weighing machines	2	2	—	—	—	—	16	—	—	
Wire drawers	5	1	—	—	—	—	50	—	—	St. Helen's.
Wire manufacture	4	3	36	563	970	31,635	6,078	300	—	Wigan, Burgy.
Woollen manufacture	39	23	399	414	678	11,715	2,270	—	—	Burgy, Wigan, and steam coal.
Woollen printers	8	5	6	65	8	2,795	1,007	—	—	Burgy, Mountain Mine, steam.
Worsted manufacture	4	4	4	81	200	1,130	12	—	—	Slack.
Worsted spinners	2	2	2	70	160	1,320	70	—	—	
Yarn doublers	2	1	1	5	--	300	—	—	—	Slack.
Yarn spinners	1	1	2	26½	—	300	50	—	—	Blend.
Zinc workers	3	1	—	—	—	—	8	--	—	
Total	2,810	1,367	2,633	51,496	119,568	1,585,471	550,045	12,553	—	

Total number of circulars issued - - - 2,810
„ „ *returned* - - - 1,485

Leaving the Coal from one thousand three hundred and twenty-five works to be estimated.

	Tons.
Coal returned as used for steam engines	1,535,471
„ „ for other purposes	550,045
Coke used computed as Coal	20,082
Total	2,105,598
Coal *estimated* as used by steam-engines, not returned	*1,144,200*
„ „ for other purposes	*407,500*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Lancashire	3,657,298

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(12.) MANCHESTER.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement manufacturers.	4	3	2	40	—	900	100	—	—	South Yorkshire, engine coal,
Asphalters - -	7	3	3	20	—	150	100	—	—	Burgy.
Axle Tree makers - -	6	5	38	1,060	—	9,096	25,385	—	—	Burgy.
Bandanna and corah printers.	11	7	5	110	—	1,275	65	—	—	Burgy, Adlington, Winstanley, Orrell.
Baths - - -	8	4	1	6	—	50	140	76	--	Burgy.
Bleachers - -	40	19	124	1,685	1,454	68,857	27,514	—		Burgy, Leeds, Oldham, Denton, Lancashire, Trencherbone, Arley, and Yard Mine coal.
Boiler makers - -	25	14	54	954	70	14,372	13,382	228	—	Worsley, Trencherbone, Lancashire, Bardsley, Astley, Pendlebury, and Burgy.
Brass founders - -	45	29	25	645	90	6,837	3,011	978	—	Wigan, Silkstone, Yorkshire, Durham, coke.
Braziers and coppersmiths.	25	13	2	11	—	250	439	70	—	Smithy, Burgy, Oldham, Silkstone.
Brewers - -	87	46	18	189	—	8,540	3,760	—	—	Leeds, Stanton, Bretley, Wigan, Derbyshire, Moston, and Dixon Green.
Brick makers - -	53	14	5	57	—	558	9,761	—	—	Burgy.
Button makers - -	2	2	3	45	136,762	1,979	—	—	—	Burgy.
Calenderers, makers up, and packers.	27	18	28	507	—	5,889	28,891	—	—	Burgy, Silkstone, Clifton, round coal.
Calico printers - -	90	66	647	6,173	1,020	250,641	79,663	—	—	Burgy, Arley, cannel, Wigan, steam coal.
Canvas manufacturers -	14	7	8	1,055	—	1,090	371	62	—	Burgy.
Carpet manufacturers -	29	13	8	122	—	3,122	1,284	—	—	Wigan, Pemberton, Burgy, and steam coal.
Chemical works - -	46	33	55	725	—	36,741	36,366	791	—	Burgy, Clayton, Oldham, Astley, Wigan, Trenchebone, Mountain coal, bituminous, Moston, and Lancashire.
Candlewicks - -	4	2	—	—	—	—	3	—	—	Steam power hired.
Cotton spinners -	328	248	768	37,699	16,065	1,045,827	28,329	208	--	Burgy, Mountain Mine, Black Mine, Dukinfield, cannel, Wigan, delf, Marsden, Bradford, Oldham, Dunkirk, South Yorkshire, Mesnes, Worsley, Tyldesley, Barnsley, smithy coal.
Cotton twine and banding -	13	2	—	—	—	—	—	—	--	No steam engines nor coal employed.
Distillers - -	4	3	2 stills	—	—	22	36	—	—	
Dyers - -	60	35	115	1,795	—	57,128	102,284	—	—	Wigan, Burgy, Black Mine.
Earthenware - -	—	2	2	10	—	221	1,599	—	—	
Engineers - -	128	70	107	3,855	1,124	45,074	21,013	1,962	—	Burgy, Denton, Ashton, Moston, Oldham, Black Mine, West Leigh, Silkstone, Foxhole, smithy coal.
Elastic web, &c.	—	4	5	155	65	3,114	—	—	—	Burgy, Bagworth, Leicester.
Fancy drills - -	16	8	6	79	—	2,212	664	—	—	Cannel, Pemberton.
Felt manufacturers -	7	3	1	—	80	960	33	—	—	
Fender manufacturers -	11	8	1	8	—	209	277	—	—	
File makers - -	17	12	2	26	—	591	163	—	—	Best house coal.
Filter manufacturers -	3	1	—	—	—	—	200	—	—	Brewery coal.
Finishers - -	32	20	44	876	660	29,103	4,728	—	—	Burgy.
Fire bricks - -	15	11	35	355	140	13,218	27,832	—	—	Burgy, Beeston, Wortley.
Flax spinners - -	11	6	14	1,356	25	12,126	2,087	—	—	Clifton Moss, Burgy.
Floor cloth - - -	3	1	—	—	—	—	2	—	—	No coal used in manufacture.
Fustian manufacturers -	67	35	22	1,266	350	24,055	197	—	—	Silkstone, Wigan, Burgy.
Gas apparatus - -	20	7	2	9	—	146	56	24	—	Scotch coal.
Gingham manufacturers -	25	14	19	929	300	16,423	429	—	—	Burgy.
Glass manufacturers -	22	15	14	1,001	—	16,979	56,897	—	—	Burgy, Blend, Roofers.
Grease manufacturers -	16	7	5	53	—	734	263	—	—	Burgy, Wigan,
Gum makers - -	10	6	—	—	—	—	19	—	—	Best house.
Heald yarn, &c. - -	6	2	7	130	—	4,396	965	—	—	Halifax Bed.
Iron Bedsteads - -	6	2	—	—	—	—	60	—	—	Silkstone, and Black Mine.
Iron Fencing - -	3	1	1	6	—	200	200	—	—	Burgy.
Iron founders - -	32	17	22	227	—	6,509	4,919	2,506	—	Moston, Burgy, Black Mine, Ashton-under-Lyne, Manchester, Oldham.
Iron manufacturers -	5	2	38	732½	—	162,163	9,407	—	—	Bradford.
Iron and red liquor, &c. -	3	2	1	6	—	30	164	—	—	Burgy.
Jacquard machinery -	3	2	2	44	—	2,726	1,347	—	—	Burgy, Clifton, Pendlebury, Lancashire.
Lathe and tool - -	5	2	3	30	—	513	172	—	—	Wigan and Silkstone.
Lead merchant - -	6	4	5	54	—	1,112	15	—	—	Burgh, Westleigh, Lancashire.
Leather cloth - -	5	4	1	1½	—	15	219	—	—	Burgy.
Linen manufacturers -	20	8	14	536	75	10,706	186	—	—	Burgy, Wigan.
Linen thread - -	7	3	5	170	300	3,480	735	—	—	Burgy.
Machine makers - -	55	27	24	270	745	8,854	366	—	—	Hardley Green, smithy coal, Burgy.

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Description of Manufactures.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Machinery, band, and strapping, &c.	18	9	7	65	—	14,650	6,089	—	—	House coal.
Marquees, cart and wagon sheets.	7	3	—	—	—	—	6	—	—	House coal.
Metal manufacturers	6	6	46	1,869	—	26,819	55	80	—	Wigan, Burgy, West Leigh.
Matting, &c.	7	2	1	3	—	105	—	—	—	Burgy.
Mill furnishers	18	5	1	5	—	208	20	—	—	Wigan.
Millers	30	18	21	444	100	14,881	153	—	—	Burgy, Shirecoaks, Yorkshire, Welsh.
Mill makers	3	1	—	—	—	—	38	—	—	Smithy.
Nankeen, Jean, &c.	20	7	3	54	90	1,800	362	—	—	Trencherbone, Wigan, Burgy.
Needle manufacturers	2	1	—	—	—	—	—	—	—	No information.
Oil cloth	18	9	2	11	—	222	197	—	—	Burgy, Oldham.
Oil manufacturers	8	1	—	—	—	—	30	—	—	
Paper stainers, &c.	16	8	9	61	—	1,066	57	—	—	Yorkshire, Burgy.
Paper manufacturers	31	17	90	1,397	646	64,862	2,131	—	—	Burgy, Worsley.
Patent waterproof, &c.	9	5	7	750	—	10,385	1,830	—	—	Burgy.
Printers	83	47	20	101	32	1,210	245	—	—	Burgy, Silkstone, Atherton, Pendleton.
Print block and stamp cutters.	16	3	—	—	—	—	3	—	—	
Ribbon, galloon	12	7	1	4	14	362	2	—	—	Burgy.
Rope, twine, &c.	14	5	—	—	—	—	4	—	—	No coal used in the rope manufacture.
Saw mills	32	16	25	311	257½	6,054	82	—	—	Burgy, Wigan, Bolton, Oldham, Astley, Black Mine, Trencherbone.
Sewing cotton manufacturers.	19	14	29	550	1,495	11,486	30	—	—	Burgy, Bradford.
Sewing machine	7	1	1	1	—	13	—	—	—	Burgy.
Screws, bolts, and rivets	20	6	4	28	—	490	478	—	—	Burgy, Silkstone, Wigan, Arley Mine, smithy.
Shirtings, &c.	12	3	—	—	—	—	—	—	—	No information.
Silk and worsted	10	4		160	120	1,670	—	—	—	
Silk, worsted, and cotton	15	8	17	128½	522	2,376	763	—	—	Burgy, Wigan.
Silk manufacturers	27	15	11	120	147	3,150	778	—	—	Burgy, Moston, Yorkshire, West Leigh.
Small ware	22	14	7	128	217	3,110	408	—	—	Moira, Staveley, Clay Cross, Worsley, Burgy.
Soap manufacturers	—	4	—	—	—	—	229	—	—	Burgy.
Starch and gum	8	3	3	18	12	439	372	—	—	Marland, Burgy.
Stove and grate	8	5	2	8	15	389	70	—	—	Burgy, smithy.
Stuff, merino, and mousseline de laine, &c.	11	5	11	117	310	1,861	—	—	—	Wigan, Burgy.
Sugar refiners	2	2	8	91	190	13,800	—	—	—	Burgy, Wigan, St. Helen.
Tallow chandlers	11	6	2	10	—	145	45	—	—	Wigan, Burgy, Black Mine.
Tablecovers, damask	7	1	—	—	—	—	20	—	—	
Tin plate	8	4	1	9	—	85	178	—	—	Burgy.
Varnish	4	4	3	28	50	550	349	—	—	Burgy.
Wadding and jewellers cotton.	4	1	1	12	20	300	600	—	—	
Wire manufacturers	6	5	7	88	110	1,490	164	—	—	Burgy.
Woollen cloth	7	2	—	—	—	—	—	—	—	No information.
Vulcanized Indian rubber	7	—	—	—	—	—	—	—	—	None returned.
Worsted spinners	6	3	2	80	320	2,225	25	—	—	Burgy.
Total	2,138	1,172	2,655	71,134½	163,992½	2,065,345	511,911	6,985	—	

Total number of circulars issued - - - 2,138
" " *returned* - - - 1,172

Leaving the Coal for nine hundred and sixty-six works to be estimated.

	Tons.
Coal returned as used by steam engines	2,065,345
" " for other purposes	511,911
Coke used computed as Coal	8,779
Total	2,586,035
Coal *estimated* as used by steam engines, not returned	*351,000*
" " for other purposes	*420,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Manchester	3,357,035

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(13.) LIVERPOOL.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.	Tons.	Tons.	Tons.	Tons.	
Anchor smiths and shipbuilders.	65	34	14	182	226	5,760	2,898	—	—	Lancashire, Staffordshire, Wigan, Burgy, North Wales, South Wales, coke.
Alkali manufacture	3	1	18	100	130	4,592	58,125	—	—	Mixture, coke, &c.
Asphalte manufacture	3	2	1	8	—	865	—	—	—	Burgy, good coal, coke, &c.
Baths	8	6	1	6	—	84	2,143	30	—	Burgy, Wigan, four-foot coal.
Bell founders	1	1	—	—	—	—	—	—	—	Not in business.
Bolt manufacturer	2	1	2	8	10	200	100	340	—	Burgy.
Borax refiner	2	1	3	10	15	2,400	—	—	—	Burgy.
Bleachers	2	2	2	7	6	179	58	—	—	Atherton and King.
Blue manufacturer	—	1	—	—	—	—	—	50	—	Gas coke for drying.
Boiler and tank makers	25	15	22	278	349	7,085	2,190	180	—	Burgy, Lancashire, Sanky Brook, Wigan, steam coal, Bainford five-foot, Tawd Vale, Holland, smiths' nuts, coke.
Brass founders	17	9	11	113	54	2,508	1,118	210	—	Burgy, steam coal, Wigan, English, engine slack.
Brick makers	25	19	8	105	10	7,958	10,305	160	—	Wigan, Rainford Main, Holland, Orrell, Pemberton, Lindsay coal, Atherton, steam coal, St. Helen's.,
Brewers	52	25	24	110½	69½	5,224	1,467	—	—	Cannel coal, Atherton, steam, Lancashire, Bickenshaw, Burgy Wheston, Wigan, Haydock, Bushy Park, St. Helen's, Skelmerdale.
Canvas manufacture	26	9	4	78	140	2,604	31	—	—	Welsh coal, house coal. On one firm uses engines.
Calenderers	1	8	—	—	—	117	—	—	—	Burgy.
Chemists, manufacturing	33	20	34	326½	83	89,027	75,273	—	—	Lancashire, Burgy, best engin coal, Wigan, Mold, Ruabon, St. Helen's.
Chain cables	12	5	1	30	—	1,000	1,143½	10	—	Slack. Only one firm uses an engine.
Distillers	9	7	9	316	12	4,660	1,380	—	—	Bushy Park, South Holland, Burgy, Wigan.
Drain pipes	6	3	—	—	—	—	3	—	—	House coal. Firms given up manufacturing.
Dyers	20	10	2	25	25	460	196	—	—	Welsh, Atherton, Orrell, common coal, Wigan, Birkenhead, gas coke.
Engineers	48	20	26	284	222½	4,731	1,789½	955	—	North Wales, main coal, Burgy, Wigan, Lancashire, Pemberton, Newcastle, coke, smith's coal.
Glass bottle maker	6	3	—	—	—	—	9,392	—	—	Burgy, culm.
Glass manufacture	20	7	—	—	—	—	3,668	—	—	House coal and slack, Bushy Park, gas used.
Glass plate	2	1	—	—	—	—	30	—	—	For domestic use.
India-rubber	5	4	3	114	240	2,667	176½	—	—	Burgy, Wigan, King coal, Pemberton.
Iron founders	85	24	39	352½	414½	8,654	2,939¼	2,301½	—	Lancashire, St. Helen's, Wigan, Prescot, Burgy, bakers coal, steam, North Wales, Ince Hall, Bickerstaffe, Wigan, steam and coke, Bushy Park, Sherrington.
Machine makers	18	4	4	11½	4	349	52	—	—	Best coal, Burgy, Rainford. One gas-engine used.
Millwrights	6	4	3	13	12	242	90	—	—	Wigan, slack, Ince Hall coal.
Millers	48	22	36	995	1,278	27,497	885½	—	—	Burgy, steam coal, St. Helen's, Lancashire, Skelmersdale district. One windmill used.
Mustard makers	3	2	1	16	20	400	20	—	—	Skelmersdale colliery.
Oil and colour manufacturers.	33	19	13	174	220	4,918	251	—	—	Wigan, Burgy, steam coal, Lancashire, Sankey bank colliery.
Printers	—	23	18	96½	59	1,361	107	—	—	Wigan, steam coal, Lancashire, Burgy, Orrell lumps, Welsh. One gas-engine used.
Saw millers	24	16	19	342	341	5,792	320½	—	—	Lancashire, Burgy, St. Helen's, engine slack, and a gas-engine.
Seed crushers	5	4	5	85	226	4,094½	—	—	—	Lancashire, Burgy, Edge Green, steam, St. Helen's.
Shipbuilders	7	3	1	40	—	140	359	13	—	Welsh, steam, smith's coal, slack.
Soap boilers	20	11	28	68	—	15,100	2,934	—	—	Engine coal, Burgy, Skelmersdale colliery, St. Helen's, Wigan.
Sugar refiners	10	9	94	858	790	42,795	33,960	—	—	Lancashire, Wigan, Burgy, steam, Silverdale; 1,300 tons animal charcoal.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Turpentine, &c.	7	5	4	43	—	500	889	—	—	Lancashire, steam, Bickerstaffe.
Waterproofers	5	4	—	—	—	—	31	2	—	Coal for domestic purposes.
Zinc manufactures	8	4	4	76	—	1,170	12	—	—	Burgy from Leigh, house coal.
Total of Liverpool	622	368	454	5,271½	4,956½	255,078½	184,336¾	4,351½	—	

Total number of circulars issued - - - 622
" " *returned* - - - 368

Leaving the Coal for two hundred and fifty-four works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	255,078½
" " for other purposes - - - - - - -	184,336¾
Coke used computed as Coal - - - - - -	6,081
Total - - - - - - -	445,496¼
Coal *estimated* as used by steam-engines, not returned - - - - -	*25,750¾*
" " for other purposes - - - - - -	*97,500*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Liverpool	568,747

(14.) LEICESTERSHIRE AND RUTLAND.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	7	2	2	15	—	260	25	120	—	Leicester, slack, Wigan.
Bakers	28	17	3	28	—	510	430	—	—	Leicester, Derby, soft coal, Portland, Langley, Underwood Colliery.
Baths	4	2	1	—		—	370	—	—	Slack and dust.
Bell founders	1	—	—	—	—	—	—	—	—	
Bleachers	2	2	4	70	—	2,460	1,335	—	—	Soft coal, Derby, Leicester.
Bone, &c.	1	1	1	10	—	300	—	—	—	Mixed slack and coal.
Brass founders	7	2	2	7	—	144	—	128	—	Derby, Swannington coal.
Brewers	28	16	8	33	—	1,644	734	80	—	Leicestershire, Derbyshire, hard, soft, Whitwick, Ibstock, Swannick.
Brickmakers	27	11	1	4	—	156	3,135	—	—	Portland, soft, Denby Hall, Shipley colliery.
Cement, &c.	1	1	—	—	—	—	—	—	—	No information.
Drain pipes	3	2	—	—	—	—	350	—	—	Derbyshire coal.
Dyers	15	7	6	49	—	2,485	838	—	—	Derbyshire, Swannington, Ibstock, Whitwick.
Elastic web, &c.	15	10	10	218	171	4,303	—	8¼	—	Leicestershire, Snibston, Coleorton, Ibstock, Whitwick, Bagworth, Nailston collieries.
Earthenware	5	2	—	—	—	—	3,460½	—	—	Slack.
Engineers	16	8	11	145	30	1,862	387	42½	—	Hard steam, Swannington.
Glue manufacturer	2	1	1	8	12	300	100	32	—	Swadlincote.
Hosiery manufacturer	23	10	5	36	50	1,352	85	—	—	Leicestershire, Shipley bright, Seghill, Swannington, Derbyshire.
Iron founder	6	2	2	10	—	200	7	136	—	Snibstone, main coal.
Lime burner	8	1	—	—	—	—	150	—	—	Leicestershire, Derbyshire coal
Machine owners	8	4	2	13	—	86	5½	—	—	Best hard.
Machinists	7	4	3	5	—	162	69	—	—	Swannington soft coal.
Maltsters	20	10	3	32	25	1,531	49½	147½	—	Derby, hard coal.
Millers	37	13	4	92	—	1,757	209	—	—	Derbyshire, Leicester, hard, soft.
Newspapers	9	3	1	5	—	26	50	—	—	Snibstone, slack.
Printers	14	9	5	14½	—	640	101¾	—	—	Midland, Snibstone, Whitwick, Swannington.
Railway carriage builders	2	1	8	—	—	250	241½	—	—	Slack.
Saw mills	9	3	2	22	—	535	150	—	—	Leicester, Ibstock, &c.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Sewing cotton	5	1	1	16	—	225	—	—	—	Leicester coal.
Tallow, &c.	10	5	2	6	—	109	33	—	—	Main coal, mixed, Elun Hill.
Wool sheet	2	2	—	—	—	—	12	—	—	Whitwick.
Worsted spinners	15	13	20	741	913	12,792	674	1½	—	Derbyshire, Snibstone, Ibstock.
Total of Rutland and Leicestershire	332	165	108	1,579½	1,201	34,089	13,001¾	694¾	—	

Total number of circulars issued - - - 332
" " *returned* - - - 165

Leaving the Coal for one hundred and sixty-seven works to be estimated.

	Tons.
Coal returned as used for steam engines	34,089
" " for other purposes	13,001¾
Coke used computed as Coal	1,100¼
Total	48,191
Coal *estimated* as used by steam engines, not returned	*35,000*
" " for other purposes	*13,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Leicestershire and Rutland	96,191

(15.) LINCOLNSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	50	23	13	83	156	1,421	1,160	594	—	Hards, nuts, cobbles, and slack.
Brassfounders	10	7	12	140	82	1,659	1,844	380	—	Yorkshire and Derbyshire coals.
Brewers and maltsters	49	21	11	48	—	1,395	841	664	—	Hard, malting, engine, and cobbles.
Brick and tile	41	27	5	27	—	187	5,048	—	—	Nuts, cobbles, slack, and soft.
Engineers, mechanical	28	10	11	239	49	1,671	422	65	—	Slack, nuts, and smithy coal.
Dyers	25	10	1	6	—	30	173	17	—	Hard, main, seconds, and nuts.
Ironfounders	7	2	2	5	—	34	66	10	—	Nuts, steam, and smiths' coal.
Total of Lincolnshire	205	100	55	548	287	6,397	9,554	1,730	—	

Total number of circulars issued - - - 205
" " *returned* - - - 100

Leaving the Coal from one hundred and five works to be estimated.

	Tons.
Coal returned as used for steam-engines	6,397
" " for other purposes	9,554
Coke used computed as Coal	2,422
Total	18,373
Coal *estimated* as used by steam engines, not returned*	*6,500*
" " for other purposes	*7,750*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Lincolnshire	32,623

* These estimates include a large number of agricultural steam engines, maltsters, &c. &c., to whom circular forms were not sent, special inquiries of a personal nature having been instituted.

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(16.) MIDDLESEX (not including LONDON).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Bleachers	3	1	6	60	—	1,440	15	53	—	Welsh and inland.
Brewers	48	24	20	140	52	2,624	2,419	—	190	Furnace, small, nuts, Derbyshire, Staffordshire, and Wallsend.
Brickmakers	42	15	9	105	—	1,280	1,216	2,001	—	Small and nuts, Derbyshire and Leicestershire.
Engineers	10	3	3	60	—	493	267	90	—	Welsh and Tanfield.
Millers	25	9	7	123	76	2,812	100	530	—	Hard, steam, nuts, Staveley, and Lambton.
Newspapers	7	3	1	2	—	8	8	—	—	Hand power principally employed.
Saw mills	5	2	2	46	—	356	4	—	—	Powell's Duffryn and sea coal.
Seed crushers	2	1	2	50	120	1,450	—	—	—	Aberdare.
Soap manufacturers	2	2	1	14	—	1,560	112	—	—	Hard, steam, Bullerley, and Newcastle.
Total of Middlesex	144	60	57	600	248	12,623	4,141	2,674	190	

Total number of circulars issued - - - 144
" " *returned* - - - 60

Leaving the coal for eighty-four works to be estimated.

	Tons.
Coal returned as used for steam engines	12,023
" " for other purposes	4,141
Coke used computed as Coal	3,744
Total	19,908
Coal *estimated* as used by steam engines, not returned	*2,000*
" " other purposes	*16,800*
Total Coal used in the manufacture (other than Pig and Malleable Iron) of Middlesex	38,708

(17.) LONDON.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Actual Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement makers.	14	4	4	27		380	372	—	—	Hartley, Tanfield, hard, steam, and slack.
Anchor chain makers	9	7	8	156		4,806	12,060	—	—	Tanfield and Welsh hard; a little coke and charcoal.
Asphalte makers	3	1	—	—		—	120	—	—	Hard, steam.
Assayers	3	2	2	41		320	50	250	—	Merthyr, smokeless, Derby hard steam.
Axletree makers	10	3	50	1,977		41,065	217,820	—	—	Tanfield, steam coal, South Stafford.
Anti-friction powder machines.	1	1	2	30		220	300	—	—	Welsh and Hartley.
Benzine distillers	8	6	6	38		100	2,372	—	—	Hard steam coal and Newcastle.
Baths and wash-houses	18	9	4	34	14	955	1,644	2,327	—	12 boilers; best Welsh, smokeless, and steam.
Bleachers	8	5	4	22		350	429	1,069	—	Hard steam and smokeless.
Blue manufacturers	11	5	4	77		1,000	75	—	—	Newcastle, Hartley, hard steam, North Stafford.
Brass founders	34	12	10	121		1,618	2,219	359	—	Staffordshire, Tanfield, West Elsecar.
Boiler makers	5	5	5	86		510	353	156	—	North country, Tanfield, hard steam, and coke.
Bone crushers	4	4	2	20		416	274	—	—	Welsh hard steam, Hartley.
Bottle makers	8	3	26	974		18,000	132,000	—	—	Thick coal and heath coal, small to large.
Bolt and nut makers	6	3	3	60		650	882	523	—	Merthyr steam, Tanfield.
Brick makers	28	18	21	341		7,412	8,944½	892	—	Gas coke for engines. Steam coal, Tanfield, Mosley Main, Watts, Newcastle, Babington, hard and steam.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Brewers	75	45	75	1,056		17,178	41,082	1,549	—	Hard steam, Welsh, smokeless, Hartley, Harlich, patent fuel, Merthyr, Leicestershire, Derbyshire, hard.
Builders	14	6	12	367		2,705	1,596	—	—	Seaborne, Duffryn, steam, Tanfield, Cannock Chase, Hartley; gas coke for engine.
Coppersmiths	18	10	18	387		1,279	1,214	242	—	Whitworth, Welsh, Tanfield, Wallsend; 4,017 bushels of cinders, Duffryn.
Candle makers	18	10	26	128		3,325	11,362½	—	—	Tanfield, Welsh, hard, steam, Tanfield, Babington, cannel, Aberdare, steam.
Chemical works	30	14	26	230		4,296	23,481	135	—	Evenwood, Taidrow, steam, Brownhills, Tanfield, Seaborne, Inland, hard, steam, and coke.
Cocoa makers	5	3	6	128		1,611	77	—	—	Dudley, steam, Welsh, hard, steam, Hetton's.
Coffee roasters	9	3	1	5		20	—	255	—	Small coal and coke.
Diving machine makers	5	2	2	4	6	79	43	—	—	Hard steam, Tamfield.
Colour works	6	6	14	209		2,267	1,562	—	—	Weardale, Scotch, hard, steam, Welsh, Hartley.
Card manufacturers	12	10	13	87		1,341½	100	599	—	Hard steam, Welsh, Wallsend, and coke.
Distillers	40	25	29	450		8,291	12,865½	428	—	Anthracite, Pelton's, Wallsend, Welsh, Hartley, Aberdare, Derbyshire, smokeless, steam, Yorkshire, Merthyr.
Engineers	151	88	189	2,731½		70,832	84,733½	10,490	—	Silkstone, Duffryn, Hartley, Tanfield, smiths', hard steam, Allerton Moor, Newcastle, stone coal, heather, thick, Stanfield, Wallsend, Langley hard, Wigan, Leicester, Merthyr, Babbington, Ruabon, hard smithy, Portland hard, Aberdare, Northumberland, Durham, Welsh, steam.
Houses of Parliament	—	—	—	—		—	—	1,416	1,143	Bwllfa, Merthyr.
Felt makers	11	6	7	78		1,818½	65	63	—	Welsh, Tanfield, hard, steam, Hetton, coke.
Floor cloth makers	12	10	12	214		2,601	300	—	—	Various, hard steam, Welsh, Babbington, coke.
Gas pipe makers	8	6	3	66		610	540	—	—	Silkstone, Welsh, Hartley.
Glue makers	10	2	—	—		—	20	—	—	Silkstone.
Grease makers	17	2	1	1		—	—	12	—	Coke only.
Glass makers	17	14	12	256		136,618	2,361	11,571	—	Baddesley, household, hard steam.
Plate-glass makers	6	2	1	8		136	2½	—	—	Welsh, household.
Gunpowder makers	9	5	40	618		10,167	2,184	—	—	Anthracite, Newcastle, Welsh steam, splint coal.
Hot-water apparatus makers	21	10	3	38		210	128	81	—	Tanfield, Welsh, Wallsend, smiths'.
Hydraulic machine makers	8	4	7	60		736	188½	—	—	Welsh, Wallsend, hard steam, Tanfield, Hartley.
India-rubber makers	30	13	36	1,020		10,702	1,949	731	—	Bituminous, steam, Yorkshire, Port Pool, Butterley, hard, Clay Cross, Silkstone.
Iron founders	37	19	24	227		2,719	6,321	763	—	Stafford, Hartley, steam, Tanfield, Walker Primrose, hard steam, Willenhall Barnsley, Shipley, coke.
Iron door makers	7	4	3	31½		462	25	38	—	Tanfield, Silkstone, hard steam.
Lime burners	9	6	12	246		2,023	47,631	996	—	Welsh, Hartley, Newcastle.
Lead manufacturers	4	4	6	120		716	1,021	9	—	Hard steam, Welsh, inland, Newcastle.
Lead pipe makers	4	1	1	6		108	4	—	—	West Hartley.
Methylated spirit makers	5	3	..	..		—	—	—	—	No coal used.
Maltsters	3	2	3	25		705	721	—	—	Anthracite, Welsh, hard steam, hard cobbles.
Millers	9	8	12	325		3,507	26	223	—	House coal, Welsh, smokeless, Wallsend, common engine coal, coke; water power also.
Mill makers	6	2	—	—		—	40	—	—	Tanfield, Wallsend, Silkstone.
Millwrights	3	3	2	7		130	29	—	—	Cannock, Wallsend.
Naphtha distillers	8	5	3	30		—	800	—	—	Hard steam, Hartley. Oil used for fuel.
Oil refiners and seed crushers.	27	26	30	762	164	15,443	3,363	—	—	Fothergill's Aberdare, hard steam, Hartley, Weardale steam, Wallsend, Yorkshire, Prince's, Pearce's, West Holywell, Clay Cross, Babbington, Welsh steam.
Ordnance store makers	4	1	..	—	—	—	—	—	—	
Pitch and tar makers	7	5	2	24		356	138	—	—	Smokeless steam.
Printers	69	40	33	340	287½	5,851	342	299	—	Hartley, Silkstone, Welsh, hard steam, Wallsend, Cannock Chase, Aberdare, Welsh steam, smokeless, Duffryn, Newcastle, Deep, Wigan steam.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Actual Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Potters	27	15	12	297	25	3,754	22,172	276	—	Welsh, Wylands, hard steam, Holywell, Hartley, Wallsend, Silkstone, Mosely bright, Denbighshire, inland, Tunstall.
Paper stainers	7	5	9	46	43	1,214	232	—	—	Hard steam, Hartley's.
Rope makers	13	13	13	211	46	3,081	184	351	—	Hard steam, Hartley's, Langley, Newcastle, Clay Cross.
Ship builders	17	8	14	221	54	1,344	2,724	—	—	Tanfield, Hartley, Wallsend, Stavely's hard, Pearce's West.
Ship smiths	14	6	—	—	—	—	289	—	—	Tanfield.
Printing machine makers	5	3	3	20		362	98	—	—	Hard steam, Tanfield, Hartley.
Soap makers	37	19	35	157	16	1,784	11,029	68	—	Hartley's, hard steam, South Wales, steam, Silkstone, Duffryn steam, Wylan, Holywell, smokeless.
Sugar refiners	18	11	48	755		21,556	11,133	—	—	Tanfield, Hartley, hard steam, Pearce's West, Langley, Whitworth, Welsh, Holywell, Seaborne, Durham, inland.
Saw mills	23	15	25	627		5,521	105	371	—	Steam, Welsh, Wallsend, Tanfield, Butterly, hard steam, Newcastle hard, Silkstone, coke.
Terra-cotta works	3	1	—	—		—	—	—	—	No coal used.
Telegraph works	7	2	7	100		250	20	—	—	Lilleshall furnace coal, Welsh.
Tool makers	14	4	—	—		—	3	—	—	Wallsend.
Tube drawers	11	4	1	50		600	20	—	—	Derbyshire, hard steam.
Type founders	14	8	2	12	8	—	372	209	—	Silkstone, Wallsend, hard steam, inland.
Total of London	1,104	627	979	16,780	618½	425,106	624,611	36,756	1,143	

Total number of circulars issued - - - 1,104
" " *returned* - - - 627

Leaving the Coal for four hundred and seventy-seven works to be estimated.

	Tons.
Coal returned as used for steam engines	425,106
" " for other purposes	624,611
Coke used computed as Coal	41,459
Anthracite	1,143
Total	1,092,319
Coal *estimated* as used by steam engines, not returned	*135,000*
" " for other purposes	*175,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of London	1,402,319

(18.) NORTHUMBERLAND (not including NEWCASTLE).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Axle makers	2	1	1	—	—	300	70	—	—	Small.
Asphalte	1	1	—	—	—	—	85	—	—	Unscreened.
Anchor manufacturers	4	—	—	—	—	—	—	—	—	
Bone crushers	3	1	—	—	—	—	400	—	—	Splints.
Brewers	16	8	6	—	—	847	1,275	273	—	Round, small, splint, and steam.
Brick and tiles	14	9	6	12	—	1,172	4,238	—	—	Unscreened, small, and dust.
Cement	4	—	—	—	—	—	—	—	—	
Copperas	4	—		—	—	—	—	—	—	
Drain pipe	5	3	3	—	—	1,365	4,676	—	—	Etal Colliery.
Earthenware	6	3	5	—	—	6,164	12,084	173	—	Small, round, and splints.
File makers	3	—	—	—	—	—	—	—	—	
Engineers	5	4	13	—	—	6,206	6,115	1,732	—	Wallbottle, Pontop, and Montague
Glass manufacture	3	1	1	—	—	320	1,480	—	—	Small coals.
Iron founders	8	4	6	—	—	1,504	3,750	174	—	Small and nuts.
Lime burners	9	6	6	—	—	1,301	12,124	—	—	Small coals, refuse, and seconds.
Lime manufacturers	3	—		—	—	—		—	—	
Salt manufacturers	3	2	2	—	—	218	1,455	—	—	Small coals.

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Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Saw mills - -	12	10	16	100	—	4,901	11,249	—	—	Nuts, duff, splints, Hilda, Elswick, &c.
Seed crushers - -	3	1	2	—	—	—	1,176	—	—	Small steam coal, Cramlington and Walker.
Steam-engine boilers -	5	3	6	—	—	1,005	1,565	—	—	Small and smithy, Scremerston Colliery.
Soap manufacturers -	2	2	2	—	—	795	112	—	—	Steam coal and nuts, West Hartley.
Woollen manufacturers -	10	5	1	—	—	270	260	—	—	Nuts, small, &c., Howard's Hartley.
Total of Northumberland -	125	64	76	112	—	26,368	62,114	2,352	—	

Total number of circular issued - - 125
" " *returned* - - 64

Leaving the Coal for sixty-one works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	26,368
" " for other purposes - - - - - -	62,114
Coke computed as Coal - - - - - -	3,293
	91,775
Coal *estimated* as used by steam engines, not returned - - - - -	*15,500*
" " for other purposes - - - - - -	*45,750*
Total Coal used in manufactures (other than Pig and Malleable Iron) in Northumberland	153,025

(19.) NEWCASTLE (NORTHUMBERLAND).

Description of Manufacture.	Circulars. No sent out.	Circulars. No returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
ichor makers - -		2	6	—	93	695	4,102	—	—	Small.
ick and tile makers -		15	19	—	320	11,889	31,716	—	—	Soft, steam, Brockwell main, small.
ke makers - -		6	21	—	708	37,487	702,011	—	—	Duff, small.
pperas makers - -		2	—	—	—	—	784	—	—	
gineers - - -		1	24	—	1,200	17,000	10,000	33,000	—	Steam.
rthenware manufacturers		9	6	—	136	4,219	12,567	—	—	Best, steam, small.
ss makers - -		8	9	—	89	1,158	21,615	—	—	Steam, small, Walker small.
n founders - -		5	10	—	139	3,447	4,074	—	—	Steam, small.
ite lead manufacturers -		1	5	118	—	790	7,196	—	—	Small and nuts.
re rope makers - -		1	1	12	17	372	89	—	—	Steam, gas coal.
Total for Newcastle -	130	50	101	130	2,702	77,057	794,154	33,000	—	

Total number of circulars issued - - - 130
" " *returned* - - - 50

Leaving the Coal for eighty works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	77,057
" " for other purposes - - - - - - -	794,154
Coke used computed as Coal - - - - - - -	44,000
Anthracite - - - - - - -	—
Total - - - - - - -	915,211
Coal *estimated* as used by steam engines, not returned - - - - -	56,750
" " for other purposes - - - - - -	65,500
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Newcastle -	1,037,461

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(20.) NOTTINGHAMSHIRE.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement manufacturer.	8	5	3	31	45	561	273	100	—	Smithy, slack, Cinder Hill.
Baths	4	2	1	4	—	260	35	—	—	Cobbles.
Bleachers	16	11	34	203	109	13,227	3,778	—	—	Slack, cobbles, Pinxton, Babbington.
Bobbin manufacturer	16	8	6	60	50	6,153	97	—	—	Slack, Pinxton.
Bone crushers	2	1	2	48	—	1,050	184	—	—	Hard coal.
Brass founders	18	2	1	8	12	150	200	2	—	Shipley, Hucknall.
Brewers	26	16	12	74½	64	2,152	1,777	50	—	Slack, cobbles, Derby, soft, hard. Shipley.
Brick maker	63	28	9	110	—	1,051	11,812	—	—	Hard, soft, Derbyshire, Cinder Hill &c.
Cotton doublers	9	9	15	318	455	7,412	529	—	—	Hard, slack, cobbles, Pinxton, Butterly.
Cotton spinners	6	2	2	60	150	1,716	—	—	—	Hard, cobbles.
Dyers	10	4	8	39	53	962	2,995	—	—	Pinxton, nuts, soft, slack, hard.
Elastic web manufacture	6	4	1	25	36	480	—	12	—	Screened, slack.
Engineers	21	12	15	367½	35½	4,881	356	—	—	Smiths, cobbles, slack, Derby, Pinxton.
Glue manufacture	1	1	1	20	—	930	312	—	—	Soft coal and cobbles.
Hosiery manufacturers	36	28	15	177	163	4,044½	662	—	—	Cobbles and slack.
Iron founders	12	7	6	42½	18	698	446	—	—	Slack, cobbles, Pinxton.
Lace thread manufacture	7	3	4	64	16	1,112	65	—	—	Pinxton, slack, cobbles.
Lime burners	11	2	—	—	—	—	1,790	—	—	Hard coal.
Machinists	21	9	2	28	36	580	106	12	—	Slack.
Maltsters	32	18	5	15	—	120	161	6,473	—	Hard, steam, and Pinxton.
Millers	37	14	10	243	248	5,414	54	1,011	—	Slack, hard, Shirecaks, Babbington.
Newspapers	8	6	5	26	25	279	54	—	—	Hard, Derby and Notts, Clay Cross Pinxton.
Paper manufacture	6	3	3	48	40	1,800	—	—	—	Hard, Shirecaks, Pinxton, slack.
Printers	16	10	2	14	—	311	41	—	—	Eastwood, Watnall, Langton. cobbles.
Saw mills	10	4	11	138	24	2,680	620	—	—	Portland, Butterley, slack.
Silk manufacture	2	2	5	90	165	2,161	10	—	—	Hard, soft, Cinder Hill, Babbington
Tallow	6	3	—	—	—	—	46	—	—	Derbyshire, soft and hard.
Total for Nottinghamshire	410	214	178	2,253½	1,744½	60,284½	26,403	7,660	—	

Total number of circulars issued - - - 410
„ „ *returned* - - - 214

Leaving the Coal for one hundred and ninety-six works to be estimated.

	Tons.
Coal returned as used for steam engines	60,284
„ „ for other purposes	26,403
Coke used computed at Coal	10,734
Total	97,421
Coal *estimated* as used by steam engines, not returned	*45,000*
„ „ for other purposes	*19,600*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Nottinghamshire	162,021

(21.) SHROPSHIRE.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement makers	12	6	4	7	18	440	114	97	—	Staffordshire, wall and bench.
Brass founders	5	2	2	8	4	208	328	—	—	Lancaster wall, bench.
Brewers	9	4	1	—	6	180	120	60	—	Yard nuts.
Brick and tile makers	46	15	5	30	29	333	5,266	—	—	New mine, sulphur.
Boiler makers	1	—	—	—	—	—	—	—	—	

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Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Bone crushers	2	1	—	—	—	—	—	—	—	
Carpet makers	3	1	1	14	35	800	—	—	—	Slack.
Charcoal manufacturers	1	1	2	45	10	100	—	—	—	Engine slack.
Chain makers	5	1	3	—	25	600	—	—	—	Slack.
Engineers	9	4	1	7	9	118	95	—	—	Shropshire, Cannock Chase deep.
Iron founders	7	2	1	6	—	116	120	—	—	Various.
Lime burners	37	13	1	7	—	20	4,474	—	—	North Wales, lime coal.
Maltsters	63	14	2	—	18	55	133	407	—	Lilleshall, Staffordshire, Welsh, Wigan.
Printers	7	2	1	—	3½	10	15	—	—	Shropshire.
Woolen manufactures	1	1	—	—	—	—	—	—	—	
Woolstaplers	7	3	2	11	—	230	20	10	—	Lancashire, Welsh.
Miscellaneous	5	—	—	—	—	—	—	—	—	
Total	220	70	26	135	157½	3,120	10,685	574	—	

Total number of circulars issued - - - 220
" " *returned* - - - 70

Leaving the Coal for one hundred and fifty works to be estimated.

	Tons.
Coal returned as used for steam engines	3,210
" " for other purposes	10,685
Coke used computed as Coal	804
Total	14,699
Coal *estimated* as used by steam engines, not returned	*6,000*
" " for other purposes	*6,450*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Shropshire	27,149

(22.) STAFFORDSHIRE (BIRMINGHAM and STAFFORDSHIRE POTTERIES not included).

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purpose.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement makers.	14	7	3	19	27	426	609	—	—	Wyley, slack.
Air pipe makers	2	1	2	15	12	150	90	—	—	Thick.
Alum manufacturer	1	1	1	—	18	1,800	—	—	—	Slack.
Ammonia manufacturer	1	1	1	7	—	900	—	—	—	South Staffordshire, slack.
Anchor manufacturers	11	4	5	106	150	2,591	2,208	—	—	Slack, coke.
Anvil manufacture	1	1	1	10	—	150	—	—	—	Bottom coal.
Armour plate	1	—	—	—	—	—	—	—	—	
Artist's palette maker	1	1	1	—	5	—	877	—	—	Slack and coal.
Axletree manufacturers	15	7	48	1,209	16	14,989½	97,315	—	—	New Mine, slack.
Back band manufacturers	2	—	—	—	—	—	—	—	—	
Baths, public	7	4	1	—	—	140	40	—	—	Slack.
Beer machine manufacturers	3	1	—	—	—	—	1,200	—	—	Cockshead, hard.
Bellows manufacturers	6	2	—	—	—	—	21	—	—	Cannock Chase.
Bolt manufacturers	34	11	10	83	80	3,122	4,012	300	—	New Mine, slack, coke.
Boiler plate makers	6	1	3	120	—	789	13,710	—	—	Rowley, Bloxwich.
Bottle maker	1	1	—	—	—	—	3,720	—	—	Thick and slack.
Box iron makers	3	3	3	6	36	1,364	376	—	—	Welsh, slack.
Brass founders	81	49	27	209	310	8,433	6,378	1,849	—	New Mine, Durham Thick, Staffordshire, Deep, Cannock, hard, slack.
Brewers	68	47	82	1,090	207	37,556	46,261	167	—	Great Row, cannel, soft, Rowhurst, Hoxhead, Thick, Derbyshire, Newhall, Bretby, New Mine.
Brick and tile makers	61	37	54	859	475	43,217	47,713	—	—	Barnsley, deep, Thick, Blackband, New Moor, fire clay coal, yard, rough.
Bundle makers	3	1	1	1	—	44	—	—	—	Slack.
Cash box makers	2	1	—	—	—	—	25	—	—	Rough, slack.
Cement makers	9	4	5	101	—	2,680	952	—	—	Derbyshire, Thick, New Mine.
Chain makers	52	18	10	69	22	1,561	2,252	400	—	Thick, slack.
Chemists	13	8	6	80	12	2,327	5,824	—	—	Thick, furnace, slack.
Coach smiths	6	3	2	4	16	450	60	—	—	Staffordshire, New Mine, slack.
Cock founders	5	1	1	14	—	—	—	—	—	49*l.* 11*s.* 8½*d.* expended in coal.

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Color manufacturers	18	11	—	—	—	—	856	—	—	Moss, Wolly Lane, Great Row, thick, yard.
Copper smelters	2	—	—	—	—	—	—	—	—	
Cotton spinners	3	3	8	360	1,077	7,248	820	—	—	Cannel, slack.
Currycomb manufacturers	9	4	—	—	—	—	96	—	—	Thick, slack.
Distillers	2	2	—	—	—	—	48	—	—	Slack.
Drain pipe manufacturers	14	2	1	20	—	800	1,224	—	—	Staffordshire, hard, slack.
Dyers	27	14	3	19	4	392	1,359	—	—	Slack, cobbles,
Engineers	67	29	48	737	242½	18,049	17,615	557	—	Cannock Chase, Thick, hard, New Mine, Rowhurst.
Edge tool manufacturers	5	4	16	391	—	1,000	21,311	111	—	Slack.
Electro-plate company	1	1	1	8	—	—	250	—	—	Rough, slack.
File cutters	21	18	—	—	—	—	984	—	—	Hard, heather, bottom, Thick, New Mine, brown.
Fireproof safe makers	12	7	2	19	—	180	264	321	—	Cannock Chase, Kibbles, slack.
Frying pan makers	—	—	—	—	—	—	—	—	—	
Gas fitting manufacturers	7	3	3	18	12	488	62	—	—	New Mine, slack.
Grease manufacturers	7	1	—	—	—	—	200	—	—	Slack.
Gridiron makers	8	5	2	2	3	33	77	6	—	New Mine, Slack.
Gun makers	9	5	4	31	76	1,290	450	—	—	Slack.
Hammer makers	5	1	—	—	—	—	10	—	—	Slack.
Hinge makers	8	4	1	8	6	180	58	—	—	Thick, coal, slack.
Hook makers	2	—	—	—	—	—	—	—	—	
Hot-water apparatus	2	—	—	—	—	—	—	—	—	
Iron founders	62	27	50	753	722	11,392	46,101	50	—	Cannock Chase, Deep, shallow, Brayhills, Thick, Bowhurst, hard, heather, New Mine, moss, South Staffordshire.
Iron boat builders	3	2	2	8	12	62	266	—	—	New Mine, slack.
Iron hurdle manufacturers	8	3	2	11	—	617	5	6	—	Slack.
Iron and tin-plate manufacturers.	22	7	22	531	305	16,836	36,086	1,050	—	New Mine, Thick, slack.
Iron and tin-plate workers	19	2	1	10	8	350	668	—	—	Staffordshire, Thick.
Lathe makers	3	1	—	—	—	—	—	—	—	
Lime burners	25	9	7	47	74	500	20,970	—	—	Slack.
Machinists	9	3	1	3	—	—	34	—	—	Best coal, slack.
Maltsters	110	43	9	13	73½	300	2,317	787	—	Cannock, Staffordshire, New Mine, Brownhills.
Manure manufacturers	5		2	60	—	3,000	2,620	—		Slack.
Mill makers	7	4	—	—	—	—	91	40	—	Slack.
Millwright	6	1	1	16	10	200	30	—	—	Moss and ash slack.
Nut manufacturers	5	—	—	—	—	—	—	—	—	
Paper makers	5	4	14	303	—	7,308	—	—	—	Warwickshire, slack.
Printers	6	3	2	2	2½	78	2	—	—	Hard, common.
Pump makers	7	—	—	—	—	—	—	—	—	
Railway furniture makers	9	5	10	183	387	7,430	37,710	70	—	New Mine, Bolton, five feet.
Saw mills	6	3	3	37	25	1,040	—	—	—	Hard, slack, water power.
Screw manufacturers	6	5	6	8	96	360	30	—	—	Thick, slack.
Spade makers	7	1	—	—	—	—	5	—	—	Slack.
Spring makers	4	1	2	18	45	832	832	—	—	Slack.
Silk manufacturers	36	25	18	99	116	3,022	93	10	—	Slack.
Steam engine boiler makers	18	11	18	128	104	3,173	8,208	60	—	Slack, Thick, best.
Steam saw mills	2	2	2	32	—	470	12	—	—	Slack,
Steel manufacture	7	2	1	—	45	1,000	2,000	—	—	New Mine.
Tin-plate manufacturers	5	2	2	26	—	455	1,095	—	—	Slack.
Tool makers	5	1	1	—	10	160	5	—	—	Selsall, coal, slack.
Wire manufacturers	4	1	—	—	—	—	—	—	—	
Wench manufacturers	1	—	—	—	—	—	—	—	—	
Total of Staffordshire	1,052	492	532	7,903	4,841	211,834	438,007	5,784	—	

Total number of circulars issued - - - 1,052
„ „ *returned* - - - 492

Leaving the Coal for five hundred and sixty works to be estimated.

	Tons.
Coal returned as used for steam engines	211,834
„ „ for other purposes	438,007
Coke used computed as Coal	9,254
Total	659,095
Coal *estimated* as used by steam engines, not returned	*111,250*
„ „ for other purposes	*545,000*
Total Coal used in the manufactures (other than Pig or Malleable Iron, Glass, Chemical Manufactures, Potteries, and Smelters*) of Staffordshire	1,315,345

* See Coal used in Iron Manufactures, Glass Makers, Chemists, Potters, and Smelters in their separate Tables.

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(23.) STAFFORDSHIRE POTTERIES.

Districts.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other Purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Hanley - - -	50	31	10	134	98	6,002	76,594	—	—	Hardmine, Rowhurst, Cockshead, Ash, Great Row, Knowles, Banbury, Holly Lane, Norton, Bowling Alley, Ash, Bullhurst, Burnwood, Great Row, Cannel Row.
Tunstall - - -	20	17	8	205	128	6,906	63,589	—	—	Hurst, Wrigley, Peacock, Twist, potters' coal.
Longton - - -	68	36	3	55	—	1,822	64,866	—	—	Birches, Hardmine, Cockshead, Ash, Yard, Great Row, Rowhurst, Moss, North Staffordshire.
Fenton - - -	13	11	10	75	174	15,297	52,861	—	—	Great Row, Knowles, Cockshead, Birchells, Moss, Ash, potters' coal.
Burslem - - -	55	23	19	263	155	12,691	92,199	—	—	Great Row, Burnwood, North Staffordshire, Winghay, Derbyshire, Chalks, Cannel Row.
Stoke-on-Trent - -	12	10	7	61	72	2,050	80,726	—	—	Moss, Yard, Great Row, North Staffordshire, Ash.
Various Towns - -	11	10	13	179	—	9,329	22,457	—	—	Warwickshire, Thick Heather, New Mine, Rowhurst, Peacock, Cockshead, Barry Mine.
Total of Staffordshire Potteries - -	229	138	70	1,071	528	54,097	454,693	—	—	

Total number of circulars issued - - - 229
„ „ *returned* - - - 138

Leaving the Coal for ninety-one works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	54,097
„ „ for other purposes - - - - - -	454,693
Coke used computed as Coal - - - - - -	—
Total - - - - - - -	508,790
Coal *estimated* as used by steam engines, not returned - - - -	*27,000*
„ „ for other purposes - - - - - -	*24,300*
Total Coal used in the Staffordshire Potteries for pottery alone -	560,090

(24.) BIRMINGHAM.

Statement of Steam Engines, Boilers, and Furnaces in the various Wards within the Borough of BIRMINGHAM.*

Name of Ward.	Horse power of Engines.				Boilers.	Casting or Smelting Furnaces.	Muffles.	Drying Stoves.	Rateable Value.
	No.	H. P.†	No.	L. P.‡					£
All Saints -	32	245	9	224	44	72	22	23	6,593
Ladywood - -	98	1,208	21	728	136	131	59	24	17,170
Hampton - -	37	324	4	225	46	87	23	37	5,921
St. George's -	59	707	15	430	88	63	58	44	8,328
Duddeston and Nechells.	75	860	23	693	120	93	55	53	10,980
St. Mary's - -	34	274	2	42	40	61	28	28	3,395
St. Peter's - -	44	469	5	286	60	50	46	23	5,582
St. Martin's - -	47	447	2	103	52	22	14	20	5,003
Market Hall -	14	81	—	—	15	29	2	—	1,954
Deritend and Bordesley	84	901	8	313	101	225	54	102	13,081
Edgbaston - -	1	50	—	—	1	—	—	—	173
St. Thomas' -	55	643	6	132	64	82	22	30	7,283
St. Paul's - -	45	414	4	111	53	98	27	17	6,874
Grand Total -	625	6,623	99	3,287	820	1,013	410	401	£92,337

High-pressure engines - - -	625	Horse-power H. P. - - - -	6,623
Low-pressure engines - - - -	99	Horse-power L. P. - - - -	3,287
Total of engines - - -	724	Total Horse-power - -	9,910

* Supplied by the engineer of the borough:—
In eighteen brass-foundry establishments in Birmingham they used, of coal - - 19,414 tons.
of coke - - 1,200 „

† H. P. high-pressure. ‡ L. P. low-pressure.

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(25.) SURREY.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other Purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Asphalte manufacturers	1	—	—	—	—	—	—	—	—	
Animal charcoal manufacturers.	1	—	—	—	—	—	—	—	—	
Bleachers	4	4	5	28	—	412	150	2	—	Steam, Inland, Silkstone, and Welsh.
Brewers	96	45	31	212	58	5,918	3,703	—	—	Slack, hard steam, nuts, Welsh, Inland, and Silkstone.
Brick and tile makers	12	9	1	4	—	20	636	29	—	Small, steam, and Yorkshire.
Candle manufacturers	3	3	6	126	—	24	14,474	36	—	Small, Wallsend, and Welsh.
Distillers	2	1	2	100	—	1,000	4,000	—	—	Watney's Anthracite.
Drain pipe manufacturers	6	3	1	6	—	800	430	—	—	Slack and cobbles.
Drug grinders	2	1	1	8	—	40	—	26	—	Small coal.
Engineers	28	15	8	57	120	733	190	650	—	Screenings, small, steam, Tanfield, and Newcastle.
Gunpowder manufacturers	2	1	1	20	—	80	100	—	—	Anthracite.
Lime burners	7	4	1	10	—	33	4,449	26	—	Small, Newcastle, Derbyshire, and Welsh.
Millers	23	12	6	66	12	750	95	—	—	Small, steam, Newcastle, and Silkstone.
Maltsters	16	4	—	—	—	—	—	—	66	Welsh.
Saw mills	19	5	5	63	55	315	4	312	—	Small, hard, steam, and Newcastle.
Soap manufacturers	6	3	—	—	—	—	—	—	212	Welsh.
Total	228	110	68	700	245	10,125	28,231	1,081	278	

Total number of circulars issued - - - 228
" " *returned* - - - 110

Leaving the Coal for one hundred and eighteen works to be estimated.

	Tons.
Coal returned as used for steam engines	10,125
" " for other purposes	28,231
Coke used computed as Coal	1,513
Anthracite	278
Total	40,147
Coal *estimated* as used by steam engines, not returned	*7,252*
" " for other purposes	*25,500*
Total Coal used in the manufactures of Surrey	72,899

(26.) SUSSEX.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used. Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other Purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brass founders	9	4	2	10	—	75	117	50	—	Steam coal, South Hetton.
Brewers	88	36	19	74	63	2,102	1,617	309	—	Cobbles, small, Newcastle, Sunderland, Hetton, and Wallsend.
Brickmakers	32	8	1	10	—	50	361	—	—	Hard, seconds, and Derbyshire.
Candle manufacturers	2	2	2	10	5	171	12	127	—	Newcastle and silkstone.
Confectioners	2	1	—	—	—	—	80	20	—	
Engineers	9	8	2	12	—	156	38	5	—	Small coal.
Gunpowder manufacturers	2	—	—	—	—	—	—	—	—	
Ironfounders	5	3	2	5	4	2	51	60	—	Dust and Tanfield.
Lime burners	8	1	1	2	—	12	639	—	—	Unscreened, dust, and Welsh.
Maltsters	13	4	—	—	—	—	96	—	—	Welsh coal and Newcastle.
Printers	16	5	1	6	—	—	15	—	—	Screenings and Wallsend.
Saw mills	6	3	3	50	57	470	32	—	—	Wallsend and screenings.
Soap manufacturers	2	1	1	—	25	300	—	—	—	
Total of Sussex	194	71	34	179	154	3,338	3,003	521	—	

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Total number of circulars issued - - - 194
" " *returned* - - 60

Leaving the coal from one hundred and thirty-four works to be estimated.

	Tons.
COAL returned as used for steam engines - - - - -	3,638
" " for other purposes - - - - - -	3,003
COKE used computed as coal - - - - - - -	726
Total - - - - - - - -	7,067
COAL *estimated* as used for steam engines, not returned - - -	*6,500*
" " other purposes -	*5,000*
Total used in the manufactures of SUSSEX - -	18,567

(27.) WARWICKSHIRE.

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement manufacturers	6	3	—	—	—	—	20	22	—	Smiths', Cannock Chase.
Brewers - -	6	6	7	9	53	2,104	1,192	40	—	Hard, small, slack, cobbles.
Brick and tile manufacturers	63	36	19	170	96	15,179	11,261	259	—	Slack, cobbles.
Card manufacturers -	2	1	1	—	—	—	21	—	—	Cobbles.
Cement manufacturers -	4	3	9	177	70	5,919	2,600	44	—	Slack.
Chemists - -	2	1	1	10	—	273	10	—	—	
Cotton spinners - -	3	3	5	145	760	8,500	—	—	—	Cobbles, slack.
Dyers - -	13	6	5	30	96	4,114	12	—	—	Cobbles, Hawkesbury, Redworth.
Edge tool manufacturers -	2	2	1	—	2	20	3	—	—	New mine, slack.
Elastic manufacturers -	2	2	1	25	26	580	3	—	—	Pooley rough.
Engineers - -	14	8	7	20	51	710	2	54	—	Cobbles, slack.
Gas fitters - -	13	3	1	12	25	345	415	105	—	Wyken, Derbyshire.
Gelatine manufacturers -	1	1	3	—	46	2,407	—	—	—	Slack.
Iron founders - -	13	7	8	32	15	988	243	51	—	Slack, lump, smithy.
Lime burners - -	5	1	1	10	—	30	150	—	—	Cobbles.
Machinists - -	13	8	6	66	5	719	109	—	—	Staffordshire, nuts.
Maltsters - -	42	22	7	27	—	686	2,428	430	—	Staffordshire, Warwickshire, Welsh.
Manure manufacturers -	3	1	1	—	8	74	—	—	—	Slack.
Paper manufacturers -	1	1	1	6	12	120	80	—	—	Slack.
Potters - -	1	1	—	—	—	—	100	—	—	Wyhen colliery coal.
Printers - -	18	11	3	5	2	18	53	1	—	Staffordshire, Warwickshire, Leicestershire.
Saw mills -	6	4	6	53	75	1,115	33	—	—	Slack, cobbles, small.
Silk manufacturers -	5	3	2	12	28	964	52	—	—	Slack, cobbles, seven-foot.
Steam boiler manufacturers	4	3	3	22	14	600	115	—	—	Rough, soft, slack.
Woollen manufacturers -	3	2	1	60	40	457	—	—	—	Cobbles.
Total of Warwickshire -	245	139	99	891	4,124	45,924	19,122	1,006	—	

Total number of circulars issued - - - - 245
" " *returned* - - - 139

Leaving the Coal for one hundred and sixty-six works to be estimated.

	Tons.
COAL returned as used for steam engines - - - - - - -	45,924
" " for other purposes - - - - - -	19,122
COKE used computed as Coal - - - - - -	1,406
Total - - - - - - - -	66,452
COAL *estimated* as used by steam engines, not returned - - - -	*43,750*
" " for other purposes - - - - - -	*11,400*
Total Coal used in the manufactures (other than PIG and MALLEABLE IRON) of WARWICKSHIRE - - - - -	121,602

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(28.) WORCESTERSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other Purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implement makers.	7	2	1	—	4	123	30	—	—	Slack.
Anchor makers	5	2	—	—	—	—	52	52	—	
Anvil manufacturers	10	3	5	—	90	—	4,052	—	—	Slack.
Baths	4	4	3	7	—	300	110	—	—	Slack, Staffordshire and Derbyshire.
Bell founders	1	1	1	8	—	120	15	40	—	Hard Coal.
Brass founders	11	10	6	74	68	2,521	1,534	355	—	Stafford and Derby, slack and thick.
Brewers	17	7	6	8	18	555	390	69	—	Stafford, Welsh, lump, nuts, ribble.
Brick and tile manufacturers	51	22	31	421	514	87,794	35,973	—	—	Slack, lump, cobbles, nuts, Nettleton.
Carpet and rug makers	24	14	16	218	550	8,289	1,556		—	Dudley slack, lump, hard.
Chain makers	22	9	1	4	—	4	17	239	—	Hard, smiths', breezes.
China manufacture	3	1	2	25	31	560	2,400	—	—	Common.
Cotton spinners	1	1	2	—	70	1,814	—	—	—	Slack.
Drain Pipes	2	1	2	—	24	80	69	—	—	Large and small.
Engineers	13	2	1	5	—	130	40	—	—	Slack.
Glass manufacturers	3	3	2	23	12	620	3,578	—	—	Black and fine slack.
Glue manufacturers	2	2	2	—	6	121	7	—	—	Slack, broock.
Iron founders	13	11	8	28	63	1,765	1,230	1,034	—	Wigan, smiths', breezes, hard, Stafford.
Porcelain	1	1	1	38	—	648	3,012	—	—	Staffordshire hard lumps.
Lime burners	7	2	—	—	—	—	1,550	—	—	Slack.
Millwrights	6	3	2	4	3	102	9	—	—	Slack.
Maltsters	56	13	2	16	7	40	189	167	21	Dudley, Cannock Chase, Brownhill.
Printers	12	6	2	3	7	910	78	7	—	Slack, lump, brooch.
Saw mills	8	3	4	94	108	1,967	17	—	—	Slack, Staffordshire.
Soap manufacture	1	1	—	—	—	—	7	—	—	
Tin plate works	2	2	9	288	825	27,400	—	887	—	Stafford, bitumen, and thick.
Worsted spinners	6	1	3	95	430	2,700	500	—	—	Slack.
Total for Worcestershire	288	128	112	1,354	2,830	138,563	56,415	2,850	21	

Total number of circulars issued - - - 288
„ „ *returned* - - - 128

Leaving the Coal for one hundred and sixty works to be estimated.

	Tons.
Coal returned as used for steam engines	138,563
„ „ for other purposes	56,415
Coke used computed as Coal	4,560
Total	199,538
Coal *estimated* as used for steam engines, not returned	*60,750*
„ „ for other purposes	*48,450*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Worcestershire	308,738

(29.) NORTH WALES.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Brewers	—	12	5	8	10	474	683	10	—	Riddled, slack, seconds, and house coal.
Brick and tiles	—	14	9	160	—	2,294	17,555	—	—	Main, slack, and Black Park.
Copper and brass	—	1	2	40	—	3,000	5,000	—	—	Slack.
Earthenware	—	7	4	30	40	2,806	18,413	150	—	Main and best coal.
Iron founders	—	12	11	95	35	1,020	306	182	—	Main, steam, and smithy.
Lime burners	—	8	1	7	12	73	13,850	—	—	Principally slack and small coal.
Maltsters	—	9	—	—	—	—	101	11	—	Bench coal and culm.
Printers	—	1	—	—	—	—	—	—	—	No coal employed.
Oil refiners	—	5	7	10	8	—	6,888	—	—	Slack and cannel.
Total of North Wales	177	69	39	350	105	9,667	62,796	303	—	

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Total number of circulars issued	177
„ „ *returned*	69

Leaving the Coal from one hundred and eight works to be estimated.

	Tons.
Coal returned as used for steam engines	9,667
„ „ for other purposes	62,796
Coke used computed as Coal	404
Total	72,867
Coal *estimated* as used by steam engines, not returned	*12,750*
„ „ for other purposes	*25,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron and Metallurgical Works) of North Wales	110,617

(30.) SOUTH WALES.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No sent out.	No returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Brewers		17	13	46	22	1,155	1,381	—	—	Steam, stone, smokeless, and bituminous.
Brick and tile		26	15	166	137	4,010	28,472	100	—	Small, slack, steam, and unscreened.
Earthenware		1	1	27	—	1,200	2,800	—	—	Small and bituminous.
Engineers		11	12	58	53	1,754	1,618	218	—	Small, soft, and bituminous.
Flannel		6	2	9	—	133	71	—	—	Steam, small, and house.
Gunpowder		1	—	—	—	—	—	—	150	Water power principally employed.
Iron founders		26	28	189	—	3,235	3,554	860	—	Small, bituminous.
Lime burners		14	—	—	—	—	13,596	—	—	Stone coal, culm, and Anthracite.
Maltsters		19	6	59	—	1,590	4,203	16	—	Hard, stone, soft, steam, and Anthracite.
Steam boiler		3	4	30	20	1,024	376	128	—	Small, bituminous.
Woollen		4	21	23	—	216	559	—	—	Hard, soft, house, and small binding.
Total of South Wales	293	128	102	607	232	14,317	56,680	1,322	150	

Total number of circulars issued	293
„ „ *returned*	128

Leaving the Coal for one hundred and sixty-five works to be estimated.

	Tons.
Coal returned as used for steam engines	14,317
„ „ for other purposes	56,630
Coke used computed as Coal	1,762
Anthracite	150
Total	72,859
Coal *estimated* as used by steam engines, not returned	*16,750*
„ „ for other purposes	*67,500*
Total Coal used in the manufactures (other than Pig and Malleable Iron and the Metallurgical Works) of South Wales	157,109

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(31.) YORKSHIRE (NORTH AND EAST RIDING).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements manufacture.	12	5	2	10	—	276	76	—	—	Nuts, grange, Bitchburn.
Alum manufacture -	4	2	2	18	—	455	2,000	1,538	—	Small.
Bakers - -	24	8	—	—	—	—	102	—	—	Foxhill seconds, Silkstone, West Auckland.
Baths - - -	14	5	1	4	—	344	—	87	—	Victoria, &c.
Black lead manufacture -	2	2	1	8	—	170	5	—	—	Slack, Kilnhurst, &c.
Bleachers - -	1	1	—	—	—	300	50	—	—	Small and nuts.
Brass founders - -	19	6	8	48	20	565	360½	903	—	Rothven Haugh, Gawber Hall, Brancepeth.
Bone crusher - -	5	2	1	25	—	600	—	—	—	West Riding.
Brewers - -	67	27	11	66	—	1,654	1,486	193	200	Durham, Flockton, Kilnhurst, Rothwell.
Brick manufacture -	36	15	2	14	—	190	1,772	—	—	Victoria Hay Moor, Black Boy, St. Helens.
Cotton manufacture -	2	1	5	334	420	5,987	—	—	—	Victoria Colliery.
Dyers - - -	7	5	—	—	—	—	123	—	—	Bitchburn, Norwood, Flockton.
Engineers - -	22	4	11	155	251	5,011	4,466	3,718	—	Cold Knott, Auckland.
Flax manufacture -	6	3	2	32	30	1,207	—	—	—	Gawber Hall.
Iron founders - -	11	2	12	181	515	2,888	9,305	60,583	—	Haugh Moor, Cold Knott, Black Boy.
Lime burners - -	10	6	—	—	—	—	1,440	—		Wellwood.
Linen manufacture -	5	3	—	—	—	—	85	—	—	
Maltsters - -	27	11	5	22	10	493	113	423	—	Lees Wallsend, Durham.
Millers - -	40	17	8	178	125	2,967	317	15	—	Durham, Auckland, Gawber Hall, Victoria Colliery, slack, smudge.
Newspapers - -	22	11	3	32	8	534	58	2	—	Robinhoods, Gawber Hall.
Oil manufacturers -	7	5	5	97	—	3,500	50	—	—	Yorkshire.
Oil refiners -	5	4	3	55	55	1,165	90	—	—	Flockton, Victoria.
Phosphates - -	2	1	2	24	—	60	—	—	—	Gawber Hall.
Printers - -	14	8	4	13	—	219	21	24	—	Foxholes, Flockton, Barnsley.
Saw mills - -	16	7	7	123	54	1,581	24	—	—	Pearse's West Darlington, Gordon House.
Shipbuilders - -	8	1	—	—	—	—	—	—	—	
Smiths - -	38	16	—	—	—	—	458½	—	—	Bitchburn, Newton, Old Etherley, Newcastle.
Soap boilers - -	6	2	1	16	12	560	—	—	—	Victoria.
Tar manufacturers -	4	1	1	16	20	200	313	—	—	Flockton, Silkstone.
Varnish - -	3	1	2	24	—	300	—	—	—	
Total returns of the North and East Ridings of Yorkshire - -	439	182	99	1,495½	1,510	31,226	25,716	67,616½	200	

Total number of circulars issued - - - 439
" " *returned* - - - 182

Leaving the Coal for two hundred and fifty-seven works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	31,226
" " for other purposes - - - - - - -	25,716
Coke used computed as Coal - - - - - -	94,785
Total - - - - - - - -	151,727
Coal *estimated* as used by steam engines, not returned - - - - -	*35,000*
" " for other purposes - - - - - -	*30,750*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Yorkshire (North and East Ridings) - -	217,477

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(32.) YORKSHIRE (WEST RIDING).

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	22	12	4	17	1½	172	100	20	—	Silkstone, hard.
Alpaca makers	4	3	15	1,904	1,005	8,516	30,124	—	—	Low Bed, Halifax, hard, soft.
Alum makers	1	1	1	20	12	1,000	10,400	—	—	Barnsley.
Ammonia makers	2	2	66	3,212	4,320	119,000	—	—	—	Yorkshire, Derbyshire.
Anchor makers	1	1	11	225	—	2,500	9,700	—	—	Soft and hard slack.
Anvil makers	13	3	2	8	19	543	148	25	—	Barnsley, Silkstone, Thorncliff.
Armour plate makers	2	1	82	—	—	26,000	98,000	—	—	South Yorkshire, Derbyshire.
Ash pan makers	7	4	4	60	14	27,337	98,116	—	—	Hard, Tinsley.
Assayers	3	2	1	12	—	100	414	—	—	Best furnace, slack.
Axle makers	15	8	83	2,523	2,340	75,930	16,450	463,050	—	Yorkshire, steam, hard, soft, Frogow.
Baths and wash-houses	17	12	4	6	29	1,009	279	150	—	High Moor, old fox holes, Yorkshire, engine, black.
Bedstead makers	7	4	1	2	—	104	26	—	—	Slack.
Bell founders	4	4	1	2	—	92	35	231	—	Hard.
Bellows makers	6	2	—	—	—	—	4	—	—	House.
Blanket makers	42	16	11	238	426	6,393	2,374	—	—	Engine, low beds, steam, best.
Bleachers	20	8	19	169	365	5,581	10,807	—	—	West Riding, hard.
Blue makers	2	1	1	6	—	256	—	—	—	Black bed.
Bolt makers	14	5	4	8	19	509	58	—	—	Engine slack.
Bone crushers	4	2	2	28	540	300	—	—	—	South Yorkshire.
Bottle makers	17	10	5	58½	—	4,625	77,881	—	—	Ingleton slack.
Brass founders	56	29	23	261	160	7,484	4,969	9,689	—	Engine, Yorkshire, soft, hard, Low Moor, Barnsley.
Brewers	93	62	58	328½	212	16,279	11,539	402	—	Yorkshire, soft, engine, hard, Haigh Moor, Halifax stone, Silkstone, West Riding, steam.
Brick and tile	79	40	58	655	503	20,946	34,079	—	—	Soft, hard, Black bed, Drighlington, Morley Main, North Country Silkstone, Yorkshire.
Button makers	8	5	—	—	—	—	24	—	—	Slack, house.
Candle makers	4	2	1	8	—	500	25	—	—	Whitwood.
Card makers (woollen and cotton).	30	21	18	184	263	4,731	536	—	—	Wigan, Cannel, soft, hard.
Carpet & rug manufacturers	21	15	31	517	1,210	17,355	1,741	8	—	Soft, house, slack.
Cement makers	4	1	—	—	—	—	—	—	—	
Chain makers	10	6	1	10	10	250	259	20	—	Silkstone.
Charcoal burners	10	7	8	24	12	2.740	14,658	—	—	Silkstone, Park Gate.
Chemists, manufacturing	33	30	30	230	79	5,638	62,546	—	—	Halifax, soft, hard, best, Winfield slack.
Cock founders	2	1	1	1	—	50	10	—	—	Slack.
Coke burners	9	—	—	—	—	—	—	—	—	
Color makers	3	2	1	12	10	150	13	—	—	Brandon nuts.
Copperas makers	4	3	1	6	—	288	414	—	—	Wakefield, engine, slack.
Cotton manufacturers	68	39	58	1,603	4,614	32,625	3,213	—	—	Yorkshire, steam, Barnsley, Lancashire.
Cotton spinners	102	71	108	3,032	13,075	96,169	4,694	—	—	Low Moor, Barnsley, Wakefield, Towneley, Black Bed, Liversedge, cannel, steam, Bowling, Marsden, soft, Wakefield, Clifton Beds, Yorkshire.
Cotton warp size makers	7	3	3	29	30	1,330	626	—	—	Yorkshire.
Crane makers	6	5	11	115	95	4,807	1,939	15	—	Silkstone, Allerton Main, Middleton.
Crinoline steel makers	9	5	35	655	1,441	12,600	9,161	—	—	Soft, engine, slack.
Crucible makers	3	2	—	—	—	—	15	5	—	
Cutlers	138	45	31	340½	505	12,048	2,571½	2,509	—	Soft, Sheffield, Elsecar, Silkstone, Barnsley, hard, Parkgate.
Damask makers	4	—	—	—	—	—	—	—	—	
Distillers	1	1	—	—	—	—	13	—	—	Ordinary.
Drain pipe makers	5	—	—	—	—	—	—	—	—	
Dyers	46	24	54	423	233	41,857	19,739	—	—	Wakefield, Newhards, Cowett, Low Moor, Barnsley.
Dyewood cutters	5	3	2	46	90	692	3	—	—	Slack.
Earthenware	6	1	—	—	—	—	1,040	—	—	Whitwood.
Edge tool makers	41	21	13	150	78	2,705	6,877	6,639	—	Yorkshire, Derby, hard, soft.
Engineers	78	37	67	969	856	24,938	6,040	5,243	—	Hard, Barnsley, soft, steam, Newcastle, Black Bed, Halifax, Silkstone.
Engineers tool makers	28	10	5	62½	—	2,797	2,398	—	—	Soft, hard, Yorkshire.
Fender makers	6	3	4	40	98	1,490	1,528	922	—	Slack.
Flannel makers	19	3	1	15	50	624	8	—	—	Engine coal.
Flax spinners	16	10	12	457	916	10,607	530	30	—	Cannel, steam, Yorkshire.
Garden tool makers	5	2	—	—	—	78	—	—	—	Allerton Main.
Glass makers	8	2	2	12	—	10,076	1,117	360	—	Hard.
Glue makers	2	2	5	—	85	3,240	—	—	—	Soft, house.
Grease makers	10	9	13	363	1,535	14,537	1,837	—	—	Barnsley, best engine.
Gun makers	7	3	3	49	45	1,965	839	—	—	Silkstone, Barnsley.
Hammer makers	11	—	—	—	—	—	—	—	—	

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Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Hydraulic press makers	2	—	—	—	—	—	—	—	—	
Iron founders	82	35	44	487	836	13,143	5,182	1,253	—	Newcastle, Barnsley, Burnley, hard, soft.
India-rubber makers	2	1	—	—	—	—	250	—	—	Hard.
Haft and scale makers	23	12	2	15	—	605	359	—	—	Slack.
Lightning conductors	4	1	1	20	—	—	250	—	—	Hard.
Lime burners	45	24	4	36	—	1,020	30,684	4,850	—	Whitwood, Barnsley, Silkstone, Park Gate.
Linen makers	33	26	33	2,175	766½	27,610	7,054	—	—	Burgy, Barnsley, best.
Loom makers	13	4	8	79	299	4,423	515	—	—	Waterloo, slack.
Machine knife makers	38	8	3	15	20	874	425	260	—	Derbyshire, Yorkshire, hard.
Machinists	131	56	86	1,622	1,426	48,897	145,480	651	—	Auckland, soft, Black Bed, Whitwood, Gomersal, slack.
Maltsters	157	65	25	232½	349½	7,900	927	3,934	—	Garforth, Low Moor, hard, steam, Black Bed, Barnsley,
Manure manufacturers	—	6	7	84	204	2,710	1,292	—	—	Derbyshire, Yorkshire.
Millers	39	24	21	354½	735	13,925	296	14	—	Silkstone, slack.
Millwrights	13	6	4	29	56	1,360	135	—	—	Soft, slack.
Nail makers	18	6	2	40	120	713	481	—	—	Morley, slack.
Needle makers	5	3	2	30	130	498	1,360	2,119	—	Hard.
Oil manufacturers	—	3	2	8	20	1,083	—	—	—	Slack.
Packers	17	8	3	26	—	199	137	—	—	Black Bed, slack.
Paper makers	25	18	42	472	392	12,843	5,160	—	—	Yorkshire, Garforth.
Printers engineers	—	2	1	4	6	130	47	—	—	Smith and engine coal.
Printers	45	28	22	151	176	2,070	252	13	—	Garforth, Elsecar, Yorkshire, Barnsley, soft.
Pump makers	6	2	—	—	—	—	—	—	—	
Rag grinders	4	2	2	33	146	736	10	40	—	Barnsley.
Railway axle makers	6	3	13	290	225	3,333	3,017	1,113	—	Hard, steam.
Railway waggon makers	11	7	12	337	1,009	23,000	24,533	938	—	Barnsley, hard.
Saw makers	35	16	6	160	104	2,358	1,512	3,350	—	Silkstone, South Yorkshire.
Saw mills	43	23	28	427	338	7,202½	256	306	—	Middleton, Barnsley, soft, hard.
Screw makers	—	5	6	31	9	1,247	258	—	—	Best, slack.
Seed crushers	7	1	1	20	—	480	—	—	—	Slack.
Ship builders	7	3	—	—	—	—	75	—	—	Silkstone, soft.
Shoddy manufacture	6	2	4	143	400	3,609	76	—	—	Engine coal.
Silk spinners	17	14	14	470	866	6,245	2,011	—	—	Hard, Low Moor, cannel, Barnsley, Bowling.
Soap makers	17	10	5	33	8	410	946	7	—	Best, slack.
Steam engine boiler makers	24	14	16	96	60	1,638	292	760	—	Soft, hard, South Yorkshire.
Steel converters and forgers	52	27	52	1,020	793	21,918	35,776	9,458	—	Hard, soft, Silkstone.
Stuff manufacturers	126	81	73	1,854	6,045	52,154	2,427	—	—	Yorkshire, Black Bed, cannel, Low Moor, hard.
Spindle makers	18	7	4	23	37	981	192	—	—	Soft, slack.
Sugar refiners	2	1	1	14	—	1,270	420	—	—	
Tallow chandlers	8	6	2	15	8	—	780	—	—	Black, Stockton, hard.
Tow spinners	4	3	5	150	145	2,351	60	—	—	Rothwell, hard, slack.
Wire manufacturers	18	11	13	205	418	5,349	3,225	280	—	Low Moor, Duffield, soft.
Wollen spinners and manufacturers.	—	62	118	939	6,921	95,688	19,232	—	—	Soft, Barnsley, slack.
Worsted manufacturers	61	56	65	1,578	4,849	42,888	4,288	—	—	Low Moor, Whitwood, soft, West Riding, Silkstone, cannel, Halifax.
Worsted spinners	138	94	130	3,038	9,293	95,822	8,267	—	—	Black, Low Moor, Halifax, soft, Liversedge, Whitwood, Wakefield, Barnsley, hard.
Yarn spinners	15	8	8	175	170	4,495	1,491	—	—	Barnsley, hard.
Miscellaneous	—	21	37	164	1,052	36,243	39,016	—	—	
Other circulars	311	—	—	—	—	—	—	—	—	
Total	2,823	1,441	1,897	36,192	73,727½	1,179,013½	928,316½	518,664	—	

Total number of circulars issued - - - 2,823
" " *returned* - - - 1,441

Leaving the Coal for one thousand three hundred and eighty-two works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - - -	1,179,013½
" " for other purposes - - - - - - -	926,316½
Coke used computed as Coal - - - - - -	726,120
Total - - - - - - - -	2,833,450
Coal *estimated* as used by steam engines, not returned - - - - -	*605,500*
" " for other purposes - - - - - -	*760,100*
Total Coal used in the manufactures, other than Pig and Bar Iron, of Yorkshire (West Riding) - - - -	4,199,050

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APPENDIX, TABLE No. 147.

SCOTLAND.

(1.) ABERDEEN.

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brewers	—	8	8	6	26	365	641	37	—	Chews and steam coal, English and Scotch.
Brick and tiles	—	3	1	15	15	210	976	—	—	Splint coal.
Distillers	—	1	—	—	—	—	225	—	—	Scotch coal.
Engineers	—	6	12	78	28	1,686	588	216	—	English and Scotch coal.
Bone crushers	—	1	1	40	—	364	—	—	—	
Linen and cotton	—	5	17	700	1,767	13,995	750	—	—	Newcastle-upon-Tyne and Scotch coal.
Mills	—	10	3	—	85	950	50	—	—	Steam coal, English and Scotch.
Oil refiners	—	3	2	15	34	332	89	—	—	Sunderland, Newcastle, and Scotch.
Printers	—	5	3	7	7	77	34	—	—	Sunderland, Newcastle, and Scotch.
Woollen	—	7	4	45	80	1,150	1,490	—	—	Nuts, steam, Scotch and English.
Total of Aberdeen	94	49	46	906	2,042	19,129	5,843	253	—	

(2.) ARGYLESHIRE.

Distillers	25	17	11	91	44	3,335	9,403	—	—	Steam, furnace, blind, and splint.

(3.) AYRSHIRE.

Agricultural implements	—	2	2	25	13	353	300	50	—	Dross and small.
Brewers	—	1	1	3	—	10	60	—	—	Dross and household.
Carpet	—	1	3	76	106	1,884	40	—	—	Dross.
Cotton	—	1	2	140	270	2,850	1,358	44	—	Smithy and cannel coal.
Engineers	—	6	6	35	26	720	220	218	—	Dross, hard, and smithy.
Mills	—	8	3	85	12	1,020	184	—	—	Small, dross, and household.
Woollen	—	5	1	18	26	550	—	—	—	Soft coal.
Lime burners	—	2	—	—	—	—	360	—	—	Blind seconds.
Total of Ayrshire	51	26	18	382	458	7,387	2,522	312	—	

(4.) BANFFSHIRE.

Lime burners	—	2	—	—	—	—	1,053	—	—	Fifeshire coal.
Millers	—	1	1	10	—	35	1	—	—	Household coal.
Total of Banffshire	5	3	1	10	—	35	1,054	—	—	

Total number of circulars issued - - 175
" " *returned* - - - 95

Leaving the Coal from eighty works to be estimated.

	Tons.
COAL returned as used for steam engines	29,886
" " for other purposes	18,822
COKE used computed as Coal	745
Total	49,453
COAL *estimated* as used by steam engines, not returned	*27,500*
" for other purposes do.	*17,550*
Total Coal used in the manufactures (other than PIG IRON and MALLEABLE IRON) of ABERDEEN, ARGYLESHIRE, AYRSHIRE, and BANFFSHIRE	94,503

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(5.) KILMARNOCK.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	1	1	—	—	—	—	76	—	—	Dross and round coal.
Boiler makers	2	—	—	—	—	—	—	—	—	
Brass founders	2	1	1	—	20	375	645	—	—	Dross.
Calico printers	4	3	3	32	—	978	1,004	—	—	Dross.
Carpet manufacturers	5	4	6	128	—	1,978	2,036	—	—	Dross.
Dyers	5	1	—	—	—	—	50	—	—	Small coal.
Engineers	7	2	2	8	—	352	114	—	—	Dross and smithy coal.
Iron founders	2	—	—	—	—	—	—	—	—	
Wool spinners	4	3	4	56	40	1,740	146	—	—	Dross.
Total of Kilmarnock	32	15	16	219	60	5,418	4,071	—	—	

Total number of circulars issued - - - 32
„ „ *returned* - - - 15

Leaving the Coal from seventeen works to be estimated.*

	Tons.
Coal returned as used for steam engines	5,418
„ „ for other purposes	4,071
Coke used computed as Coal	—
Anthracite	—
Total	9,489
Coal *estimated* as used by steam engines, not returned	*3,500*
„ „ for other purposes „	*1,750*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Kilmarnock	14,739

* Many of those are small works using but little coal. Information has been received respecting most of them, upon which the estimate is based.

(6.) BERWICKSHIRE.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Boiler makers	—	2	4	22	—	315	620	—	—	Small and seconds, Berwick Hill.
Brewers	—	2	—	—	—	260	85	30	—	Round coal.
Iron founders	—	4	3	4	—	774	2,597	—	—	Large and house coal.
Millers	—	—	—	—	—	—	—	—	—	
Total of Berwickshire	25	8	7	26	—	1,349	3,302	30	—	

(7.) CAITHNESS-SHIRE.

Rope makers	—	3	—	—	—	—	5	—	—	Very little coal employed.
Saw mills	—	1	20	—	—	110	—	—	—	
Total for Caithness	6	4	20	—	—	110	5	—	—	Note.—About 1,600 tons of coal used in 1867 in Wick, and about 7,000 tons, Caithness County. English coal.

(8.) CLACKMANNANSHIRE.

Brewers	—	4	4	31	19	1,947	510	260	—	Small, furnace, and soft.
Distillers	—	3	11	180	125	8,179	7,144	84	—	Dross, round, and splint.
Dyers	—	2	1	10	—	400	—	—	—	Small coal.
Machine manufacturers	—	3	4	40	113	1,370	407	—	—	Smithy, small, and house.
Millers	—	1	—	—	—	—	30	—	—	House coal.
Woollen	—	29	24	351	847	10,993	3,562	—	—	Dross, Triping, chew, splint and rubble.
Total for Clackmannanshire	96	42	44	612	1,104	22,889	11,653	344	—	

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(9.) DUMBARTONSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Distillers	—	2	1	12	—	1,200	180	40	—	Lanarkshire, soft coal.
Engineers	—	9	12	114	102	3,684	5,483	301	—	Splint, Triping, smithy, and Moss.
Printers	—	5	33	524	818	61,147	23,824	—	—	Dross, furnace, and Triping.
Total for Dumbartonshire	25	16	46	650	920	66,031	29,487	341	—	

Total number of circulars issued - - - 152
" " *returned* - - - 70

Leaving the coal from eighty-two works to be estimated.

	Tons.
Coal returned as used for steam engines	90,379
" " for other purposes	44,447
Coke used computed as Coal	—
Anthracite	953
Total	135,779
Coal *estimated* as used by steam engines, not returned	*75,570*
" " for other purposes	*24,800*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Berwickshire, Caithness-shire, Clackmannanshire, and Dumbartonshire	236,149

(10.) EDINBURGHSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Bolt manufacturers	6	4	5	28	—	895	366	11	—	Dross, engine and bituminous coal.
Brick and tile	3	3	5	69	—	2,915	7,199	—	—	Dross and furnace coal.
Brewers	29	24	35	276	305	14,086	8,144	3,867	—	Furnace, dross, splint, Triping and great coal, East Lothian collieries.
Chemists	9	4	2	16	—	480	90	—	—	Dross, household, East Lothian.
Carpet	1	1	3	40	—	2,040	680	—	—	Great coal and dross.
Distillers	6	4	8	163	206	11,080	1,166	152	—	Splint and dross.
Earthenware	4	4	3	21	—	151	8,346	—	—	Great coal, sea coal, and dross.
Engineers	21	16	27	159	268	5,371	1,917	475	—	Dross, smithy and engine, Newcastle and Scotch.
Glass	6	3	2	18	55	1,030	3,435	—	5,500	Great coal, splint and dross.
Iron founders	13	5	7	54	89	1,143	1,728	437	—	Dross, Scotch and English coal.
Lime burners	1	1	—	—	—	—	2,465	—	—	Triping and dross.
Manufactures (various)	6	6	10	292	414	5,486	194	—	—	Dross and steam coal.
Mills (manufactures)	25	18	17	560	820	16,346	260	50	—	Dross, Triping, blind, and household.
Printers	10	5	4	24	24	600	98	—	—	Dross and household.
Salt	2	2	7	184	156	5,696	1,344	—	—	Soft coal and dross.
Woollen	2	1	10	12	—	230	50	—	—	Household coal.
Total for Edinburgh	146	101	145	1,886	2,337	67,499	37,482	4,992	5,500	

Total number of circulars issued - - - 144
" " *returned* - - - 101

Leaving the Coal from forty-five works to be estimated.

	Tons.
Coal returned as used for steam engines	67,499
" " for other purposes	37,482
Coke used computed as Coal	6,656
Anthracite	5,500
Total	111,637
Coal *estimated* as used by steam engines, not returned	*22,500*
" " for other purposes	*16,750*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Edinburgh	150,887

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(11.) DUMFRIESSHIRE.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements -	—	1	3	36	40	350	300	—	—	Durham and Scotch coal.
Brewers - - -	—	3	2	7	9	190	265	80	—	Ayrshire and Lanarkshire coal.
Brick and tile - -	—	4	2	14	—	710	930	—	—	Small and round coal.
Linen - - -	—	6	5	11	—	158	352	2,060	—	Lanarkshire house coal.
Mills - - -	—	5	—	—	—	11	14	24	—	House coal.
Printers - - -	—	1	1	2	—	29	—	—	—	Ordinary coal.
Woollen - - -	—	6	2	30	100	1,248	763	—	—	House coal.
Total of Dumfriesshire -	49	26	15	100	149	2,696	2,624	2,164	—	

(12.) ELGINSHIRE.

Distillers - - -	—	1	—	—	—	—	328	—	—	Scotch coal.
Engineers - - -	—	3	—	—	—	—	28	—	—	Scotch and English coal.
Saw mills - - -	—	3	2	34	—	200	—	—	—	Scotch and English coal.
Manufacturers - -	—	2	1	35	50	380	720	60	—	Newcastle coal and splints.
Total of Elginshire -	18	9	3	69	50	580	1,076	60	—	

(13.) FIFESHIRE.

Bleachers - - -	—	10	11	261	534	4,679	6,059	—	—	Chews, steam, and small coal.
Brewers - - -	—	4	1	6	—	80	164	—	—	Chews, &c.
Brick and tile - -	—	5	5	64	28	2,531	4,961	—	—	Chews, small, dross, and steam coal.
Distillers - - -	—	1	—	—	—	—	2,850	—	—	Steam coal.
Dyers - - -	—	2	1	8	—	260	150	—	—	Small, Cattlehill.
Engineers - - -	—	15	19	60	215	3,560	2,814	806	—	Chews, smithy, sphnt, and small Scotch and English.
Flax spinners - -	—	24	46	952	1,800	27,315	2,541	—	—	Chews, small, steam, and house coal.
Floorcloth - - -	—	1	2	12	14	1,248	—	—	—	Chews.
Glue - - -	—	1	1	1	—	148	40	—	—	Chews.
Ironfounders - -	—	3	1	8	—	30	271	224	—	Chews, steam, and house coal.
Linen - - -	—	39	28	420	730	9,585	3,488	—	—	Chews, steam, and house coal.
Manufacturers - -	—	6	2	22	—	25	109	—	—	Dross and chews.
Maltsters - - -	—	1	1	3	—	16	125	—	—	Scotch coal.
Mills - - -	—	3	1	70	250	1,040	105	—	—	Chews, blind, and house coal.
Total of Fifeshire -	214	115	114	1,887	3,566	50,517	23,177	1,030	—	

Total number of circulars issued - - - 281
" " *returned* - - - 150

Leaving the Coal from one hundred and thirty-one works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	53,793
" " for other purposes - - - - - -	26,877
Coke used computed as Coal - - - - -	4,337
Total - - - - - -	85,009
Coal *estimated* as used by steam engines, not returned - - - -	*32,500*
" " for other purposes - - - - - -	*21,750*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Dumfriesshire, Elginshire, and Fifeshire - - - - -	139,259

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(14.) FORFARSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Bleachers	—	10	8	161	481	5,908	6,092	—	—	Small and chews, English and Scotch.
Brick and tile	—	2	2	26	28	650	1,500	—	—	Scotch and English coal.
Canvas	—	7	4	40	—	1,000	—	—	—	All English coal.
Confectioners	—	1	8	—	—	161	26	—	—	Scotch and English.
Distillers	—	3	2	12	—	20	842	60	—	All Scotch coal.
Engineers, &c.	—	4	3	25	—	305	129	150	—	Scotch and English coal.
Flax spinners	—	17	53	1,532	4,961	35,407	3,012	—	—	Scotch and English coal.
Linen	—	29	14	451	785	5,804	475	—	—	Dross, chews, and small English and Scotch.
Mills	—	16	8	82	95	1,847.	582	—	—	Dross, chews, and small English and Scotch.
Winsey	—	1	—	—	—	—	—	—	—	No information.
Total of Forfarshire	135	90	102	2,329	6,350	51,102	12,658	210	—	

(15.) DUNDEE.

Bleachers	—	9	11	165	257	3,509	5,166	—	—	Small Scotch and English.
Brewers	—	4	2	9	14	480	150	10	—	English and Scotch coal.
Confectioners	—	2	2	24	—	1,000	1,150	—	—	Small, steam, and house coal.
Distillers	—	2	1	20	—	351	165	—	—	Fifeshire and English coal.
Engineers	—	7	14	162	383	3,926	5,245	688	—	Small, splints, and chews, Scotch and English.
Jute spinning	—	59	113	3,078	11,575	78,535	2,540	—	—	Small, dross, Scotch, and English.
Linen	—	25	40	1,145	3,649	25,455	2,744	—	—	Small and smithy, English and Scotch.
Printers	—	2	7	213	300	7,060	2,008	—	—	Dross and slack, Fifeshire.
Total of Dundee	191	110	190	4,816	16,178	120,316	19,168	698	—	

(16.) HADDINGTONSHIRE.

Brewers	—	3	2	7	—	293	63	450	—	Large coal.
Brickmakers	—	1	3	35	—	4,150	—	—	—	Dross.
Ironfounders	—	4	3	6	20	380	780	20	—	Small, furnace, and dross.
Mills	—	2	1	8	—	50	26	—	—	Chews and large coal.
Salt refiners	—	1	1	5	—	48	2,300	—	—	Common and dross.
Soap makers	—	1	—	—	—	—	517	—	—	Small coal.
Total of Haddington	28	12	10	61	20	4,921	3,686	470	—	

(17.) INVERNESS-SHIRE.

Brewers	—	2	1	5	6	100	65	13	—	Splint.
Brick and tile	—	1	1	15	—	200	750	—	—	Small.
Distillers	—	1	1	10	—	—	865	—	—	Steam. Quantities not separated.
Ironfounders	—	2	2	14	20	285	104	180	—	Splints and small, Scotch and English.
Manufacturers	—	2	2	6	38	450	130	—	—	Scotch steam coal.
Mills	—	2	1	25	80	85	—	—	—	Scotch.
Total of Inverness-shire	20	10	8	75	94	1,120	1,914	193	—	

Total number of circulars issued - - - 374
" " *returned* - - - 238

Leaving the Coal from one hundred and thirty-six works to be estimated.

	Tons.
Coal returned as used for steam engines	177,459
" " for other purposes	37,426
Coke used computed as Coal.	2,098
Total	216,983
Coal *estimated* as used by steam engines, not returned	*94,750*
" " for other purposes	*21,500*
Total Coal used in the manufactures (other than Pig or Malleable Iron) of Forfarshire, Dundee, Haddington, and Inverness-shire	333,233

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(18.) KINCARDINESHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brewers	—	3	1	6	—	69	234	22	—	Chews, Fife, and Wishaw.
Dyers	—	1	—	25	—	450	—	—	—	Small and chews.
Flax spinners	—	3	2	28	27	240	25	—	—	Scotch, steam, and English house coal.
Manufacturers	—	5	—	—	—	—	90	—	—	Nuts, &c.
Mills	—	7	—	—	—	—	174	1	—	English coal and anthracite.
Distillers	—	1	—	—	—	—	440	—	—	Great coal.
Total of Kincardineshire	28	20	3	59	27	759	963	23	—	

(19.) KINROSS-SHIRE.

Spinners	—	1	1	25	80	632	—	—	—	Chews.
Linen	—	—	—	—	—	—	—	—	—	No return.
Mills	—	—	—	—	—	—	—	—	—	No return.
	8	1	1	25	80	632	—	—	—	

(20.) LANARKSHIRE.

Brewers	—	3	1	10	—	282	114	—	—	First quality.
Brick and tile, &c.	—	19	40	588	460	25,938	40,291	375	—	Splint and dross.
Confectioner	—	1	2	35	—	750	20	—	—	Dross.
Cotton manufacturers	—	1	4	130	115	3,185	7,527	—	—	
Distillers	—	1	1	30	—	773	1,557	—	—	Dross coal.
Dyers	—	2	4	56	—	2,247	1,300	—	—	Inferior.
Lime burners	—	4	2	25	—	1,026	1,400	—	—	Dross.
Manufacturers	—	3	6	102	257	2,040	676	—	—	Dross and triping.
Mills	—	6	1	10	—	320	126	—	—	Blind coal and dross.
Ironfounders	—	15	16	157	254	6,666	13,090	440	—	Dross, smithy, ell and splint.
Printers (calico)	—	1	49	444	—	6,216	18,971	—	—	Wishaw, dross, and gas coal.
Oil refiners	—	10	22	456	688	54,788	—	—	—	Dross, splint, and triping.
Total of Lanarkshire	92	66	148	2,043	1,774	104,231	85,072	815	—	

Total number of circulars issued - - - 128
" " *returned* - - - 87

Leaving the Coal from forty-one works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	105,629
" " for other purposes - - - - - -	86,035
Coke used computed as Coal - - - - - -	1,084
Total - - - - - -	192,748
Coal *estimated* as used by steam engines, not returned - - - -	*47,500*
" " for other purposes - - - - - -	*35,750*
Total Coal used in the manufactures (other than Bar Iron) of Kincardine-shire, Kinross-shire, and Lanarkshire - - - - -	275,998

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(21.) GLASGOW.

Description of Manufacture.	Circulars. No. sent out.	Circulars. No. returned.	Steam Engines. No. returned as in use.	Steam Engines. Horse Power returned. Nominal.	Steam Engines. Horse Power returned. Indicated.	Coal. Used for Steam Engines.	Coal. Used for other purposes.	Coal. Coke.	Coal. Anthracite.	Description of Coal used, Remarks, &c.
						Tons.	Tons.	Tons.	Tons.	
Bread, biscuit, &c.	4	4	4	78	70	1,277¼	—	—	—	Dross.
Brewers and distillers	9	9	19	243	180½	12,203	—	—	—	Main coal, Wishaw, Tripping, dross, coke.
Brick makers	10	10	17	212	221	8,051½	—	—	—	Scotch dross, soft coals.
Boot and shoe manufacturers	5	5	6	48¾	64½	1,501	—	—	—	Stoneland, dross.
Brass founders	22	22	22	148¾	117½	3,412	—	—	—	Triping, Wishaw, best soft dross.
Calenderers, packers, &c.	22	22	34	396	293	9,044	—	—	—	Splint coal, Wishaw small coal, dross.
Cloth and linen	19	19	37	1,354	1,364	28,860½	—	50	—	Dross.
Confectioners	9	9	13	97½	62½	1,588	—	—	—	Stonelaw, dross, Tripping.
Dyers and bleachers	17	17	47	770	558½	105,233½	—	—	—	Wishaw dross, small coal, Tripping.
Dye-wood makers and grinders.	8	8	13	395	331	9,875½	—	—	—	Dross, Triping.
Engineers' machinery, &c.	65	65	131	1,810	2,390	47,214¼	—	—	—	Lanarkshire round coal, soft and hard drosses, Wishaw dross, Tripping.
Flour, grain mills	29	29	40	292	2,071	31,302½	—	—	—	Dross, Tripping.
Iron founders	77	77	146	2,727½	2,604	71,942½	—	98	—	Dross, Tripping, hard coal, Wishaw, splint main, Knightswood, gas coke.
Lemonade, soda water, &c.	5	5	5	17	10	280¼	—	—	—	Dross, Tripping.
Muslin and starchers	10	10	18	358	366	10,120½	—	—	—	Best Wishaw dross, large coal, Tripping.
Miscellaneous	59	59	75	1,121	1,171¼	26,509	—	208	—	Tripping, dross, soft coal, splint, Wishaw dross.
Oil and colour	18	18	19	298	217	24,075¼	—	—	—	Dross, Tripping, burning oil.
Paper makers, &c.	4	4	14	270	279	11,909	—	—	—	Dross, Ell coal, Tripping.
Printers, &c.	27	27	114	1,086½	1,367½	43,137¼	—	—	—	Dross, Tripping, hard coal, cleck.
Pottery, glass and pipes	15	15	17	491	628	9,178½	—	—	—	Dross, Tripping, small coal.
Rope makers	5	5	7	107½	81	1,624	—	—	—	Dross.
Soap and chemical	13	13	44	513	654	111,138½	—	—	—	Main coal, hard and soft dross.
Ship builders	3	3	14	256	200	5,985	—	—	—	Splint, dross.
Sugar	9	9	26	396	485	31,145	—	—	—	Best splint coals, dross, Tripping.
Tanners	4	4	6	48	39	896	—	—	—	Dross.
Workers in wood, builders, &c.	49	49	59	983	561½	19,748¾	—	—	—	Dross, Tripping, common coal, wood.
Weaving and spinning	58	58	130	6,127	13,773	147,847	—	—	—	Dross, Tripping.
Total of Glasgow	575	575	1,077	30,644	30,160	775,100	—	356	—	

Total number of circulars issued - - - 575
„ „ *returned* - - - 575

Leaving no Coal to be estimated. *None for Steam Engines.*

	Tons.
Coal returned as used for steam engines	775,100
„ „ for other purposes	—
Coke used computed as Coal	547
Total	775,647
Coal *estimated* as used by steam engines, not returned	—
„ „ for other purposes	*250,000*
Total Coal used in the manufactures (other than Pig and Malleable Iron) of Glasgow	1,025,647

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(22.) LINLITHGOWSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brick and tile - -	—	7	6	49	115	1,498	2,498	—	—	Dross, tripping, and chews.
Cotton - -	—	1	2	—	70	1,200	—	—	—	Dross.
Distillers - -	—	2	3	15	16	650	1,500	40	—	Dross and house.
Earthenware - -	—	1	3	37	150	1,500	5,500	—	—	Splint and hard.
Ironfounders - -	—	4	4	30	40	89	—	118	—	Scotch and English coal.
Lime burners - -	—	3	—	—	—	—	735	—	—	Dross and round coal.
Mills - - -	—	7	8	38	44	588	100	—	—	Dross, tripping, and steam coal
Oil refiners - -	—	7	14	141	65	10,710	34,947	—	—	Tripping and unscreened.
Salt - - -	—	1	—	—	—	—	1,402	—	—	Small coal.
Total of Linlithgowshire	52	33	40	310	500	16,235	46,682	158	—	

(23.) PEEBLESSHIRE.

Ironfounders - -	—	1	1	4	6	50	8	10	—	Good coal and dross.
Mills - - -	—	1	1	—	10	—	100	—	—	Soft Wishaw.
Woollen - - -	—	10	5	81	135	2,055	1,330	—	—	Rough, chews, triping, and dros.
Total of Peeblesshire -	18	12	7	85	151	2,105	1,438	10	—	

(24.) PERTHSHIRE.

Brassfounders - -	—	3	2	9	—	117	394	17	—	Wishaw, chews, and dross.
Bleachers - -	—	4	1	25	50	250	4,156	—	—	English and Scotch coal.
Brewers - -	—	7	5	4	24	503	427	93	—	Splint, chews, and dross.
Distillers - -	—	4	3	10	6	852	180	—	—	Dross and small coal.
Dyers - - -	—	2	1	6	—	60	5	—	—	Furnace coal and splint.
Farina - - -	—	2	—	—	—	—	40	—	—	Chews.
Flax - - -	—	6	4	120	194	1,760	790	13	—	Small and dross.
Iron foundry - -	—	3	3	9	13	413	77	96	—	Dross and chews, English and Scotch.
Mills - -	—	10	4	19	6	317	15	—	—	Chews, dross, and small.
Manufacturers - -	—	12	7	100	180	2,403	13	—	—	Splint, dross, and steam.
Rope - -	—	2	1	15	50	302	35	—	—	Dross.
Worsted - -	—	5	3	60	210	2,400	59	—	—	Small, chews, and splint.
Total of Perthshire -	97	60	34	377	733	9,377	6,191	219	—	

Total number of circulars issued - - - 167
„ „ *returned* - - 105

Leaving the Coal for sixty-two works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	27,717
„ „ for other purposes - - - - - - -	54,311
Coke used computed as Coal - - - - - -	516
Total - - - - - - -	82,544
Coal *estimated* as used by steam engines, not returned - - - -	*8,750*
„ „ for other purposes - - - - -	*20,500*
Total Coal used in the manufactures of Linlithgowshire, Peebleshire, and Perthshire - - - - - - - -	111,794

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(25.) ROXBURGHSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used. Remarks, &c.
	No sent out.	No returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brewers	—	1	1	3	—	—	—	—	—	
Dyers	—	2	—	—	26	1,683	—	—	—	Large coal and nuts..
Engineers	—	3	3	2	6	346	35	—	—	Small, nuts, and smithy.
Manufacturers	—	14	11	305	335	4,566	1,446	—	—	Engine, dross, and household.
Total of Roxburghshire	35	20	15	310	367	6,595	1,481	—	—	

(26.) RENFREWSHIRE.

Bleachers	—	8	21	59	215	8,415	3,011	—	—	Tripping, unriddled, and dross.
Brassfounders	—	4	4	26	—	454	117	182	—	Splint, dross, &c.
Boiler	—	3	6	49	115	6,688	2,127	228	—	Lanarkshire, smithy, dross, and splint.
Brewers	—	2	2	11	25	100	280	—	—	Wishaw, splints.
Brick	—	1	6	10	—	50	500	—	—	Soft coal.
Distillers	—	1	—	—	—	1,300	—	—	—	Hard, splints.
Dyers	—	1	—	—	—	—	270	—	—	Dross.
Cotton spinners	—	12	23	895	2,193	21,947	3,419	—	—	Wishaw, round, dross, and splints.
Engineers	—	12	25	277	738	6,295	3,554	112	—	Dross, smithy, tripping, and splints.
Felt	—	2	2	—	34	965	110	—	—	Tripping and dross.
Lime burners	—	2	2	—	24	396	1,214	519	—	Dross and soft coal.
Manufacturers	—	2	2	66	65	1,610	—	—	—	Dross.
Mills	—	4	3	140	210	1,228	15	—	—	Dross, splint, and blind coal.
Ropemakers	—	1	4	200	400	4,300	900	—	—	Dross.
Sugar refiners	—	9	38	288	90	54,029	10,153	—	—	Splint, steam, and dross.
Printers (calico)	—	6	205	750	2,226	50,205	2,892	—	—	
Total of Renfrewshire	96	70	343	2,771	6,335	157,977	28,562	991	—	

Total number of circulars issued - - - 131
„ „ *returned* - - - 90

Leaving the Coal for forty-one works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	164,568
„ „ for other purposes - - - - - - -	30,043
Coke used computed as Coal - - - - - - -	1,321
Anthracite - - - - - - -	—
Total - - - - - - -	195,932
Coal *estimated* as used by steam engines, not returned - - - - -	*58,700*
„ „ for other purposes - - - - - -	*11,500*
Total Coal used in the manufactures of Roxburghshire and Renfrewshire -	266,132

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(27.) PAISLEY.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Brick and tile maker -	5	3	8	125	150	4,028	16,059	—	—	Dross and common coal.
Calenderers - -	7	6	2	—	40	1,400	257	—	—	Dross.
Candle maker - -	4	3	—	—	—	—	1,095	—	—	Wishaw, dross and coal.
Curriers - -	3	3	—	—	—	—	10	—	—	Dross and coal.
Dyers - - -	27	14	15	107	40	7,988	396	—	—	Dross, Ayrshire, Wishaw, culm.
Engineers - - -	10	7	10	85	31	2,221	1,328	—	—	Dross, Ayrshire, Wishaw, Halfod, Kilsyth, smithy, and coke.
Shawl manufacture -	53	26	7	30	156	2,570	713	—	—	Dross, Wishaw, culm, &c.
Soap maker - -	4	2	—	—	—	—	843	—	—	Dross, Triping.
Starch maker - -	6	3	5	—	40	2,248	645	—	—	Dross, Wishaw, splint, soft.
Thread - - -	12	11	17	—	3,377	24,304	74	—	—	Dross, Wishaw, Ayrshire, soft.
Total - -	131	78	64	347	3,834	44,759	21,420	—	—	

Total number of circulars issued - - - 131
" " *returned* - - - 78

Leaving the Coal for fifty-three works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - -	44,759
" " for other purposes - - - - - -	21,420
Coal used computed as Coal.	
Total - - - - - -	66,179
Coal *estimated* as used by steam engines, not returned - - - - -	*32,570*
" " for other purposes - - - - - -	*17,700*
Total Coal used in the manufactures, other than Iron, of Paisley - -	116,449

(28.) SELKIRKSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Engineers - -	—	1	2	10	—	316	70	60	—	Furnace coal.
Woollen - - -	—	18	19	471	857	9,983	3,889	—	—	Chews, dross, and engine coal.
Total of Selkirkshire	38	19	21	481	857	10,299	3,959	60	—	

(29.) STIRLINGSHIRE.

Brewers - - -	—	3	3	13	20	677	28	15	—	Large coal.
Brickmakers - -	—	6	5	28	44	840	4,834	—	—	Dross, chews, and small coal.
Bolt - - -	—	2	—	—	—	—	624	—	—	Smithy coal.
Cotton - - -	—	2	2	35	50	360	80	—	—	Splint and screened.
Dyers - - -	—	4	1	15	—	4,000	30	—	—	Wishaw dross.
Distillers - - -	—	2	5	40	62	3,500	2,500	150	—	Dross and screened.
Engineers - - -	—	3	3	19	—	476	95	—	—	Splint, triping, and dross.
Ironfounders - -	—	7	9	158	—	3,485	7,239	—	—	Splint, triping, and dross.
Manufacturers - -	—	1	1	25	20	162	—	—	—	Tripping.
Mills - - -	—	1	9	—	—	45	28	—	—	
Oil and tar distillers -	—	3	3	22	—	350	2,600	—	—	Small and furnace coal.
Printers (calico) - -	—	3	50	605	463	18,789	10,499	—	—	Tripping and dross.
Screw - - -	—	1	—	—	—	—	31	—	—	Smithy coal.
Woollen - - -	—	8	10	127	435	1,865	315	—	—	Splint, chews, and dross.
Total of Stirlingshire -	82	46	101	1,087	1,094	34,499	28,403	165	—	

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(30.) SUTHERLANDSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Distillers - - -	6	1	—	—	—	—	260	—	—	Scotch and English.

(31.) SHETLAND.

Woollen - - -	6	3	4	5	—	90	2,025	—	—	English and Scotch coals.

Total number of circulars issued - - - 132
" " *returned* - - - 69

Leaving the Coal from sixty-three works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - -	44,888
" " for other purposes - - - - -	36,647
Coke used computed as Coal - - - - -	433
Total - - - - - -	81,968
Coal *estimated* as used by steam engines, not returned - - - -	*35,000*
" " for other purposes - - - -	*24,750*
Total Coal used in the manufactures (other than Iron) of Selkirkshire, Stirlingshire, Sutherlandshire, and Shetland - - - -	141,718

(32.) WIGTONSHIRE.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	Coke.	Anthracite.	
						Tons.	Tons.	Tons.	Tons.	
Brewers - - -	—	2	1	6	—	215	60	8	—	Ayrshire coal.
Brick and tile - -	—	1	1	8	—	60	500	—	—	Hurlford coal.
Distillers - - -	—	1	—	—	—	—	340	—	—	Ayrshire coal.
Ironfounders - -	—	2	1	4	25	624	8	20	—	Hard and foundry coal.
Manufacturers - -	—	1	1	—	14	190	—	—	—	
Saw mills - -	—	1	1	—	14	104	—	—	—	Ayrshire coal.
Total of Wigtonshire -	13	8	5	18	53	1,193	908	28	—	

Total number of circulars issued - - - 13
" " *returned* - - 8

Leaving the Coal from five works to be estimated.

	Tons.
Coal returned as used for steam engines - - - - - - -	1,193
" " for other purposes - - - - -	908
Coke used computed as Coal - - - - -	36
Total - - - - - - -	2,137
Coal *estimated* as used by steam engines, not returned - - - -	*750*
" " for other purposes - - - -	*425*
Total Coal used in the manufactures other than Iron of Wigtonshire - -	3,312

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APPENDIX, TABLE No. 148.

IRELAND.

Text, p. 185. The text gives full information respecting the manufacture of textile fabrics in Ireland.

This shows that in the WOOLLEN and WORSTED manufacture the average quantity of Coal used in 1868-1869 was - - - - - - - 59,388 Tons.

Text, p. 188. THE COTTON MANUFACTURE in the same years consumed an average of - - - - - - - - 12,500 Tons.

Text, p. 192. THE LINEN MANUFACTURE consumed to rge the Spindles 175,115 Tons.
And to work the Power Looms - 32,447 Tons.

The following returns from the City of DUBLIN show the consumption to have been in various manufactures 115,352 Tons.

The returns from BELFAST give a total of 340,004 Tons; of this 137,837 Tons were used in the manufactures named above, therefore for other manufactures Belfast used - - - - - - 202,167 Tons.

Sundry Manufactures not included in the above - - - } 250,000 Tons.

Total of Coal used in the Manufactures of Ireland - - 846,968 Tons.

IRELAND.

DUBLIN.

DESCRIPTION OF MANUFACTURE.	CIRCULARS.		STEAM ENGINES.			COAL.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned. Nominal.	Horse Power returned. Indicated.	Used for Steam Engines.	Used for other purposes.	COKE.	*Anthracite.*	
						Tons.	Tons.	Tons.	Tons.	
Agricultural implements	11	4	6	59	—	676	849	—	—	Scotch, Welsh coal.
Baths	4	2	1	8	—	200	187	408	—	Scotch, Whitehaven.
Bakeries	10	7	—	—	—	—	1,170	—	—	Troon, hard Ayrshire, Scotch.
Bell founders	2	1	—	—	—	—	30	—	—	Cardiff coal, wood also used.
Boiler makers	4	3	1	20	26	270	132	—	—	Cardiff, Whitehaven, Scotch, Welsh.
Brass founders	10	6	1	16	25	200	335	6	—	Whitehaven, hard Scotch, Welsh.
Brick makers	1	1	—	—	—	—	180	—	—	Coals of every description (English),
Brewers	18	8	16	171	107	6,300	14,255	—	24	Scotch, Glasgow splint, Welsh., malting stone.
Chemists	4	2	2	14	—	600	2,537	—	—	Scotch, Welsh, mixture of Workington and Maryport slack.
Carpets and rugs	1	1	—	—	—	—	6	—	—	Coal and coke.
Coppersmiths	2	1	1	4	—	—	17	—	—	Whitehaven and Swansea.
Distillers	16	5	8	126	—	6,576	3,358	—	—	Glasgow, hard Ayrshire, Scotch, steam, Wigan, Glasgow splint, Maryport, Whitehaven, Camberlane.
Flour machine manufacturers.	2	1	—	—	—	—	6	—	—	Gilcruix and Swansea.
Frieze manufactures	2	—	—	—	—	—	—	—	—	
Gas meter manufacturers	3	2	—	—	—	—	—	50	—	Coke.
Glass manufacture	3	2	—	—	—	—	7,500	—	—	Welsh bituminous, Cardiff.
Grease manufacture	1	1	—	—	—	—	6	—	—	Scotch.
Iron founders	23	12	15	101	76	1,729	940	—	—	Scotch, Swansea, Welsh, Whitehaven, Smith's, coke, water power and steam hammers used.
Lace manufacture	2	1	—	—	—	—	40	—	—	Gilcruix.
Lead manufacture	2	1	—	—	—	—	5	—	—	House coal.
Linen manufacture	2	2	1	14	20	—	30	—	—	Hard Ayrshire.
Maltsters	17	8	3	14	—	166	809	—	—	South Wales, Anthracite, Scotch steam, Welch steam, Whitehaven.
Millers	24	10	6	172	255	4,797	794	—	—	Carlisle, Scotch, Whitehaven, Kilkeny, Welsh steam coal.
Oil manufacture	3	1	—	—	—	—	190	—	—	Scotch, Welsh.
Paper makers	10	6	7	114	83	3,710	728	—	—	Swansea, Scotch, Newcastle, Welsh, smokeless, coke and water power.
Printers	11	6	6	43	—	415	89	15	—	Scotch, Wigan, Gilcruix, Whitehaven.
Saw mills	8	2	—	—	—	—	1	—	—	Whitehaven, water power and hand sawing.
Sail cloth	5	2	—	—	—	—	10	—	—	Hand power employed.
Soap manufacture	3	2	2	4	—	50	80	—	—	Hard Ayrshire, Whitehaven, Scotch.
Screw, nut and bolt	1	1	—	—	—	—	16	—	—	Welsh and coke.
Tabinet manufacture	8	3	2	12	10	318	130	—	—	Scotch, Scotch steam, hand power used.
Wadding	1	1	—	—	—	—	—	265	—	
Woollen manufacture	14	7	3	41	56	200	166	—	—	Scotch, Whitehaven, water power.
Worsted	2	1	—	—	—	—	150	—	—	Whitehaven, cannel coal.
Total Coals	230	113	81	933	658	26,207	34,746	844	24	

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Total number of circulars issued	230
" " *returned*	113
Leaving the Coal from	117 works to be estimated.

	Tons.
Coal returned as used for steam engines	26,207
" " for other purposes	34,746
Coke used computed as Coal	1,125
Anthracite	24
Total	62,102
Coal *estimated* as used by steam engines, not returned	*20,500*
" " for other purposes	*32,750*
Total Coal used in the manufactures (other than Pig and Bar Iron) of Dublin	115,352

BELFAST.

Description of Manufacture.	Circulars.		Steam Engines.			Coal.				Description of Coal used, Remarks, &c.
	No. sent out.	No. returned.	No. returned as in use.	Horse Power returned.		Used for Steam Engines.	Used for other purposes.	Coke.	*Anthracite.*	
				Nominal.	Indicated.					
						Tons.	Tons.	Tons.	Tons.	
Bleachers	43	31	85	3,449	6,370	32,302	19,139	—	—	English, Welsh, and Scotch.
Boiler makers	8	4	8	58	84	1,175	510	—	—	English, Scotch, and South Wales.
Brass founders	20	11	2	8	—	200	186	166	—	Slack, English, Scotch, and Welsh.
Brewers	5	4	2	21	—	110	12	—	—	English and Scotch.
Brick and tile makers	12	5	5	94	—	670	3,119	—	—	Nuts and slack, English and Scotch.
Chandlers	16	8	—	—	—	—	796	—	—	English and Scotch.
Chemists	6	4	4	95	150	1,179	40	—	—	Glasgow splint, hard Ayrshire, English.
Distillers	12	6	1	16	20	360	41	—	—	Hard Ayrshire.
Felt manufacture	4	3	2	40	190	1,380	475	—	—	Welsh, Scotch, English, hard Ayrshire.
Flax and hemp manufacture	13	1	—	—	—	—	—	—	—	
Flax and tow spinners	58	50	101	4,978	11,703	106,447	15,741	—	—	Glasgow splint, hard Ayrshire, English, Scotch, Welsh.
Glass manufacture	6	4	—	—	—	—	86	344½	—	English.
Linen manufacture	59	31	27	688	1,700	13,864	1,785	10	—	English, Scotch, Irish, Welsh, slack.
Machine and mill manufacture.	21	14	15	179	352	3,803	2,074	—	—	English, Scotch, Welsh.
Muslin manufacture	21	8	1	20	—	—	302	34½	—	Hard Ayrshire, English.
Muslin weavers	8	7	1	25	—	—	804	—	—	English slack.
Saw mills	9	7	8	452	240	2,873	35	—	—	English, Scotch.
Printers	6	4	2	39	117	666	1,830	—	—	Maryport.
Total for Belfast	327	202	264	10,162	20,926	165,029	46,975	555	—	

Total number of circulars issued	327
" " *returned*	202
Leaving the Coal from one hundred and twenty-five works to be estimated.	

	Tons.
Coal returned as used for steam engines	165,029
" " for other purposes	49,975
Coke used computed as Coal.	730
Total	215,734
Coal *estimated* as used by steam engines, not returned	*86,520*
" " for other purposes	*37,750*
Total Coal used in the manufactures (other than Pig and Bar Iron) of Belfast	340,004

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Appendix, Table No. 148 (*a*).

Return made by the Factory Inspector of the Steam Power employed in the Western Division of England and Wales.

Trades.	No. of Firms.	Horse Power.
Ammunition	4	94
Anchors	5	109
Anvils and Vices	10	168
Awl Blades	12	34
Axles	18	212
Bedsteads	25	236
Bellows	1	8
Bells	1	20
Birdcages	—	3
Bobbins	11	265
Boilers	45	391
Bolts, Rivets	104	1,517
Book-binders	108	1
Book Clasps	4	11
Boots and Shoes	89	171
Brass Finishing	5	8
Brass Taps	2	20
Braziers	6	20
Brewers	7	121
Bricks and Tiles	52	1,334
Bridge Builder	1	20
Britannia Metal	5	24
Brushes	5	16
Buckles	—	35
Builders	—	20
Buttons	41	171
Candles	1	32
Candlesticks	5	42
Carpets	3	2
Carriages and Waggons	31	1,222
Cart Arms	1	2
Cement	4	164
Chains	29	658
Chandeliers	15	75
Charcoal	1	40
Chemicals	45	1,244
Clocks	1	2
Clothing	28	72
Cocoa	2	125
Colours	2	96
Confectioner	1	4
Coopers	2	53
Copper Caps	1	10
Copper Mills	10	2,256
Copper Smiths	1	5
Copying Presses	1	4
Corkscrews	6	23
Cornices	2	3
Cutler	1	3
Decorator	1	12
Die Sinkers	6	11
Electro Platers	34	275
Engineers	567	9,783
Fenders and Fire Irons	17	104
Ferrules	1	12
Fishing Tackle	4	7
Fitters	6	26
Flour Mills	2	430
Forks and Spoons	10	154
Founders	663	4,498
Frames	1	4
Fuel	2	177
Furniture	20	75
Galvanizers	9	161
Gas	9	229
Gas Nipples	2	18
Gates and Hurdles	7	40
Gelatine	1	46
German Silver	4	196
Glass Cutting	37	457
Glass Manufactures	92	2,205
Gloves	18	3
Gold Thread	2	12
Grates	12	92
Gridirons	1	2
Grinders and Polishers	70	386
Guns and Pistols	46	703
Gun Locks	19	94
Handcuffs	1	4
Harness	15	21
Hats and Caps	86	481
Hinges	7	59
Hollow Ware	10	63
Hooks and Eyes	5	33
Horsehair	7	18
Horse Shoes and Tips	5	115
India Rubber	12	306
Iron Manufactures	240	36,239
Iron Platers	3	8
Iron Washers	6	51
Japanners	31	174
Jet Ornaments	5	31
Jewellers	27	37
Lead	4	187
Leather	16	232
Locks and Keys	19	50
Manure	3	115
Metal Mounting	5	24
Metal Refining	3	18
Metal Rolling	7	107
Metal Spinning	6	113
Nails	35	784
Needles	58	237
Oil	2	80
Oiled Baize	1	4
Paper	157	6,207
Penholders	1	12
Pens	11	239
Pewterers	2	4
Pins	25	178
Plumber	—	4
Potters	5	166
Printers	840	1,090
Printers and Binders	301	201
Quarries	30	699
Rails	4	452
Railway Chairs	1	7
Rifle Sights	1	4
Rings	1	3
Rollers	4	32
Rope	10	144
Rugs	1	4
Rulers	1	3
Safes	4	100
Safety Fuzes	1	10
Salt	27	620
Sash Pulleys	2	2
Saw Mills	10	251
Scientific Apparatus	2	6
Screw Propeller	1	3
Scythes	5	38
Seed Crushers	1	100
Ships and Boats	27	640
Ships' Logs	1	4
Ship Sheathing	2	380
Shot	1	40
Slate Dresser	1	95
Smelters	133	12,740
Smiths	39	287
Soda Water	2	12
Spades	27	428
Spectacle Frames	1	1
Spindles	1	1
Spirits	2	128
Springs	10	119
Stair Rods	1	4
Stampers	12	62
Starch	1	23
Stoppers	1	14
Straw Bonnets	32	12
Sugar Refiners	11	1,613
Swords	9	68
Table Covers	1	9
Thimbles	4	12
Tobacco	69	269
Tools	57	970
Toys	15	69
Traps	1	6
Trays	5	24
Tubes	52	1,524
Turners	10	82
Turntables	1	12
Umbrellas	6	22
Varnish	1	12
Watches	4	10
Wheels	4	130
Wire	52	2,207
Zinc Rolling	4	2
Total	5,034	103,568

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APPENDIX, TABLE No. 149.

STEAM VESSELS.

Ports from which Steam Vessels sail.	Number of Circulars issued.	Number of Circulars returned.	Number of Ocean Steam Vessels returned.	Number of Coasting or Tug Steam Vessels returned.	Number employed as either Ocean or Coasting returned.	Gross Tonnage of Steam Vessels returned.	Quantity of Coal consumed by all.	Quantity of Coal taken in at Foreign Ports.	Description of Coal used; also the Names of Foreign Ports where Coal is shipped.
ENGLAND and WALES.							Tons.	Tons.	
Aberystwith		3	—	3	—	398	1,510	—	Haydock and Radstock, Welsh, Bristol, and Denbighshire.
Boston		1	—	1	—	65	423	—	South Yorkshire.
Bridgewater		1	—	1	—	70	500	—	Welsh.
Burnham		1	—	1	—	95	583	—	South Wales.
Bristol		8	1	31	—	5,954	32,231	—	Risca Colliery, near Newport, South Wales, Bristol.
Cardiff		15	3	22	28	22,814	117,374	5,000	South Wales, Northumberland steam coal. Foreign ports: Malta, Gibraltar.
Carnarvon		1	—	1	—	30	400	—	Garston.
Cowes		2	—	3	—	265	190	—	South Wales and Scotch.
Dover		4	—	12	12	6,834	19,842	170	Hartley, steam coal, Welsh. Foreign port: Calais.
Falmouth		3	—	6	—	441	2,200	—	Welsh.
Faversham		2	—	3	—	68	470	—	Northumberland steam coal.
Fleetwood		3	—	7	—	2,021	22,460	—	St. Helen's, Wigan.
Gainsborough		2	—	6	—	498	2,040	—	Barnsley, Rotherham, Chesterfield.
Gloucester		4	2	8	—	1,135	12,066	—	Forest of Dean, South Wales common and steam coal, Cannock Chase, Newcastle.
Goole		4	—	19	—	2,891	24,960	—	Barnsley common and steam coal.
Grimsby		3	10	11	—	6,544	22,963	—	South Yorkshire, Wombwell Main, Staveley, Shireoaks.
Hartlepool		8	3	19		8,821	19,042	11,798	Durham. Foreign ports: Gibraltar, Malta.
Hayle		2	—	2	—	573	1,168	—	Ruabon.
Hull		28	60	25	1	42,256	106,207	8,966	Nottinghamshire, Barnsley, Darley Main, Scotch, Welsh, Newcastle, Durham, Elsecar, West Hartley, South Yorkshire steam: Foreign ports: Copenhagen, Antwerp, Dantzic. St. Vincent, Lisbon, Rotterdam, Stettin, Gibraltar.
Kingsbridge		1		1	—	11	100	—	
Jersey		1	—	1	—	73	160	—	Welsh.
Liverpool		50	218	57	—	272,608	543,699	54,083	Whitehaven, Haydock, Boghead, St. Helen's, Wigan, Welsh, Lanarkshire steam coal, Hartley, Rushby Park, Worsley steam coal. Foreign ports: Alexandria, Malta, New York, Bahia, St. Vincent, Cape de Verde Islands, Kingston, Port au Prince, St. Thomas. Also 6,251 tons of patent fuel is used.
London		86	92	169	—	164,769	545,357	24,619	Staveley, Wombwell Main, Shireoaks, Merthyr steam coal, West Hartley steam, Newport, Darley Main, Cardiff, South Durham, Ruabon wall and bench, Newcastle, Aberdeen. Foreign ports: New York, Portland, Sydney, Shanghai, Fow Chow, Mauritius, Cape of Good Hope, St. Vincent, Swinemünde, Copenhagen, Gibraltar, Malta, Vigo, Orivitza, Alexandria, Constantinople, Malaga, Antwerp, Rotterdam. Also 9,467 tons of patent fuel from Cardiff.
Llanelly		3	—	6	—	816	3,090	—	South Wales steam coal.
Lyme Regis		1	—	1	—	180	35	—	
Lymington		1	—	3	—	53	800	—	Gawber Hall and Welsh.
Lowestoft		2	1	3	—	683	1,400	—	Yorkshire, Welsh, Scotch.
Maryport		1	—	3	—	232	720	—	Lancashire.
Middlesborough		8	2	20	—	3,492	14,763	260	Durham, Cumberland, Hartley, steam. Foreign ports: Lisbon, Gibraltar.
Milford		1	—	4	—	1,377	6,580	—	
Mostyn		1	—	1	—	200	200	—	Mostyn steam coal.
Neath		4	—	6	—	467	2,512	—	South Wales, Earlswood Colliery, the Gellia steam coal.
Newcastle		24	16	59	1	14,562	58,655	5,800	Newcastle, Welsh, steam coal from the collieries north of the Tyne, Wallsend: Foreign ports: Malta, Gibraltar, Constantinople.
Newport		3	—	3	—	155	2,271	—	Cramlington and South Wales.
Newhaven		2	10	1	—	2,858	13,190	1,545	West Hartley, Ravensworth. Foreign ports; Dieppe.
Norwich		1	—	3	—	695	1,527	—	
Plymouth		2	—	5	—	218	1,153	—	Welsh.
Porth Cawl		2	2	10	—	5,669	21,190	—	South Wales.
Portsmouth		5	—	14	—	584	6,106	—	Neath, Wigan, Staffordshire Londonderry.
Ramsgate		1	—	2	—	261	620	—	West Hartley.

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Ports from which Steam Vessels sail.	Number of Circulars issued.	Number of Circulars returned.	Number of Ocean Steam Vessels returned.	Number of Coasting or Tug Steam Vessels returned	Number employed as either Ocean or Coasting returned	Gross Tonnage of Steam Vessels returned.	Quantity of Coal consumed by all.	Quantity of Coal taken in at Foreign Ports.	Description of Coal used; also the Names of Foreign Ports where Coal is shipped.
							Tons.	Tons.	
England and Wales— *continued.*									
Rochester		2	—	5	—	1,060	2,380	—	West Hartley, Newcastle.
Scarborough		1	—	1	—	40	320	—	Sunderland.
Sheerness		1	1	—	—	18,915	8,751	—	Cardiff.
Shields		35	—	44	—	1,536	30,469	—	Cramlington, Hilda, West Hartley, East Holywell, Northumberland, Wallsend, Durham.
Shoreham		1	—	1	—	15	450	—	Yorkshire.
Southampton		11	42	18	—	56,590	146,855	11,756	Risca, Aberdare, Duffryn steam coal, Hartley Main, Rock Main, Gawber Hall. Foreign ports: Mauritius and Cape Town.
Southport		1	—	1	—	34	60	—	
Stockton		3	—	12	—	1,131	12,542	—	Durham.
Sunderland		31	11	41	—	18,096	58,090	1,574	Wallsend, West Hartley, Aberdare Cardiff, Sunderland Helton-le-Hole, Lambton, Newcastle. Foreign ports: Copenhagen, Gibraltar, Malta, Alexandria, Constantinople.
Swansea		8	—	2	10	2,495	4,369	310	Swansea Vale and South Wales steam. Also 1,058 tons of patent fuel.
Tyne		19	5	18	—	6,417	18,880	1,384	Swansea semi-bituminous, Barnsley, West Hartley steam, Cramlington, Wallsend. Foreign ports: Gibraltar, Constantinople, Odessa, Alexandria.
Teignmouth		1	—	1	—	70	341	—	
Weymouth		2	3	3	—	942	4,717	—	West Hartley, West Cramlington.
Whitby		1	—	1	—	20	260	—	Durham, Northumberland, South Yorkshire.
Whitehaven		1	—	3	—	372	1,130	—	
Yarmouth		2	—	10	—	384	2,879	—	Gawber Hall, Allerton Main.
Total	—	415	482	714	52	678,053	1,803,250	127,865	
Scotland.									
Aberdeen		3	—	8	—	4,577	27,631	—	Newcastle, Scotch.
Alloa		3	—	5	—	298	2,681	—	Clackmannanshire steam.
Ardrossan		5	—	7	—	960	3,660	—	Irvine, Fergushill Colliery, Ayrshire.
Campbeltown		1	—	2	—	262	4,313	—	Lanarkshire steam.
Dundee		5	10	10	—	8,760	24,159	—	Walsend, Tunstall Main, Newcastle.
Glasgow		40	32	87	1	34,568	218,704	7,679	Welsh, Newcastle, Scotch, Durham, Comedie steam, Yorkshire. Foreign Ports: St. Petersburg, Cronstadt, Stockholm, Copenhagen, Gibraltar, Malta, Lisbon, Messina.
Grangemouth		2	—	4	—	244	2,690	—	Grangemouth.
Greenock		5	—	9	—	719	8,850	—	Wishaw, Yorkshire.
Kirkwall		1	—	1	—	101	460	—	Wishaw steam.
Leith		7	14	20	—	12,564	61,460	—	Newcastle, Grangemouth, Lanarkshire, Hull, Armiston steam, Wishaw, Welsh.
Montrose		1	—	2	—	42	300	—	Elgin Colliery.
Peterhead		1	1	—	—	325	232	—	Durham.
Troon		1	—	1	—	250	1,582	—	Ayrshire.
Total	—	75	57	156	1	63,670	356,722	7,679	
Ireland.									
Belfast		5	—	26	—	4,628	117,895	—	Newcastle, Grangemouth, Yorkshire hard steam, Flintshire.
Cork		6	—	24	—	1,204	29,178	—	Welsh.
Dublin		6	—	24	—	9,149	36,836	—	Duffryn steam, Scotch, Maryport, Wigan.
Drogheda		1	—	6	—	3,246	14,241	—	Lancashire.
Londonderry		1	—	4	—	340	2,550	—	Ayrshire.
Limerick		1	—	5	—	2,042	10,600	—	Hartley, Scotch, Liverpool.
Wexford		1	—	1	—	98	500	—	Duffryn steam.
Sligo		4	—	6	—	945	5,296	—	Kilmarnock, Lancashire steam, Whitehaven, Rushby Park, Delph, Pemberton.
Total	—	25	—	96	—	21,652	217,095	—	

Summary.

England and Wales		415	482	714	52	678,053	1,803,250	127,865	
Scotland		75	57	156		63,670	356,722	7,679	
Ireland		25	—	96	—	21,652	217,095	—	
Miscellaneous		186	—	—	—	—	—	—	Returned unanswered, vessels being lost, sold, or only built in Great Britain and immediately sent to foreign parts, &c.
Total	1,300	701	539	966	53	763,375	2,377,067	135,544	

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APPENDIX, TABLE No. 150.

COAL USED IN MAKING GAS IN THE UNITED KINGDOM.

ENGLAND.	CIRCULARS.		COAL.		GAS.	
Name of County.	Number sent out.	Number returned.	Quantity used in making gas in 1867.	Quantity used in making gas in 1868.	Average number of cubic feet of gas made per ton of coal	Description of Coal used. Remarks.
			Tons.	Tons.		
Bedfordshire -		9	9,521	9,993	8,243	Wigan, South Yorkshire coal and cannel, Silkstone, Staveley, Devonshire, Silkstone.
Berkshire - -		9	15,480	15,468	8,866	Brymbo, Ruabon, Pelaw Main, North Pelton, Wigan, Silkstone, Newcastle, Somerset cannel.
Buckinghamshire -		15	6,696	7,897	7,663	Yorkshire, New Pelton, Pelaw Main, Wigan, Llantrissant, Cannock Chase cannel, Arley Main.
Cambridgeshire -		11	12,917	13,214	8,390	Darley Main, Silkstone, Pelaw Main, Yorkshire, Staffordshire, Washington, North Brancepeth.
Cheshire - -		15	26,630	28,075	8,797	Wigan coal and cannel, Dukenfield, Worsley, Staffordshire.
Cornwall - -		13	6,958	7,266	8,765	Pelaw Main, North Pelton, Newcastle, Wallsend, Wigan cannel,
Cumberland - -		10	8,296	9,317	7,950	Newcastle, West Cumberland, common coal, Scotch, shale cannel, Mickley and Maryport cannel.
Derbyshire - -		28	26,352	41,218	8,368	Butterley New Main, Clay Cross, Dukenfield, Silkstone, Derbyshire cannel and coal, Wigan.
Devonshire - -		20	28,200	29,668	8,966	Pelaw Main, Newcastle, Sunderland, Scotch cannel, Pelton, Welsh.
Dorsetshire - -		10	7,683	10,341	8,931	Pelaw Main, Welsh, Newcastle, Cannock Chase cannel, Radstock, Brancepeth, North Pelton.
Durham - -		10	49,243	49,374	7,428	Londonderry, Townley, Hetton, Green Ash, Brancepeth coal and cannel, Pelaw, Newcastle and Durham.
Essex - -		31	27,184	32,126	8,158	New Pelton, Pelaw Main, Newcastle, Wigan, Somersetshire, Brancepeth, Durham, Wallsend Silkstone.
Gloucestershire -		19	86,866	87,635	7,864	Wigan, cannel, Welsh, Forest of Dean, Staffordshire, Yorkshire.
Hampshire - -		16	46,518	47,829	8,173	New Pelton, Brancepeth, Pelaw Main, Durham, Welsh, Lancashire cannel, Scotch cannel, Wigan.
Herefordshire -		5	5,334	5,624	8,450	Staveley, Wigan, Ruabon wall and bench cannel, Gloucestershire.
Hertfordshire -		15	7,310	9,812	8,133	South Yorkshre, Durham, New Pelton, Wigan, Old Silkstone.
Huntingdonshire -		4	2,260	2,280	8,966	Pelaw Main, Wombwell Main, Silkstone nuts.
Kent - -		86	52,456	91,057	8,235	Pelaw Main, Wigan, Plaskynaston, Brancepeth, Londonderry, Newcastle common and cannel.
Lancashire - -		48	444,112	453,302	9,432	Wigan cannel and coal, St. Helens, Oldham, Dukenfield, Arley Mine, orrel, delf, Silkstone, South Durham.
Leicestershire and Rutlandshire.		17	28,366	31,705	8,705	Derbyshire coal and cannel, South Yorkshire, furnace coal, Renishaw, Silkstone, Devonshire, and Chesterfield.
Lincolnshire - -		22	23,886	24,179	8,082	Yorkshire, Derbyshire, Yorkshire, Silkstone, Pelaw Main, Staffordshire.
Middlesex - -		16	856,252	852,946	8,618	Londonderry, Pelaw Main, Wigan cannel, Cannock Chase cannel, South Yorkshire, Silkstone.
Monmouthshire -		8	9,815	10,975	8,091	Forest of Dean, South Wales, bituminous coal from the Brithder vein.
Norfolk - -		11	27,710	29,569	8,814	New Pelaw, Sunderland, Brancepeth, Waldridge, and Wallsend.
Northamptonshire -		14	11,803	14,013	7,785	Derbyshire, Wigan, Yorkshire, Silkstone, Cannock.
Northumberland -		10	78,932	76,823	7,083	Newcastle, Parrott, Willingworth, Bedlington, Seaham, Pelton Main, Lothian cannel.
Nottinghamshire -		12	11,917	56,964	7,458	Derbyshire, Devonshire, Staffordshire, Yorkshire, Wigan cannel.
Oxfordshire - -		9	10,720	10,861	8,511	Wigan, Ruabon, Pelton, Silkstone, Staveley, Wallsend, Devonshire.
Shropshire - -		10	8,225	8,799	8,148	Wall and bench from Ruabon, Plaskynaston cannel, Shropshire, Staffordshire, Welsh.
Somersetshire -		23	32,616	34,830	8,153	Somersetshire, Welsh, Newport (Monmouthshire) Gloucester.
Staffordshire * -		21	84,141	101,270	8,119	Yorkshire, Staffordshire, Wigan, Clay Cross, North Wales coal and cannel, Burgy.

* The quantity of coal used by The Birmingham Gas Company in 1868 was 50,202 tons, and that used by the Birmingham and Staffordshire Gas Company was 96,000 tons.

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England.	Circulars.		Coal.		Gas.	
Name of County.	Number sent out.	Number returned.	Quantity used in making gas in 1867.	Quantity used in making gas in 1868.	Average number of cubic feet of gas made per ton of coal.	Description of Coal used. Remarks.
			Tons.	Tons.		
Suffolk -		17	15,103	15,907	8,578	Pelaw Main, Brancepeth, Silkstone, Waldridge, Wallsend, Londonderry, Ravensworth.
Surrey - -		16	72,832	76,355	9,208	Pelaw, New Pelton, Newcastle, Wigan cannel, Brancepeth, Boghead.
Sussex - -		21	39,991	41,926	8,915	Pelaw Main, New Pelton, Newcastle cannel, Brancepeth, Londonderry, Wigan.
Warwickshire -		14	185,034	185,355	8,302	Ruabon, Derbyshire, Wigan, Tamworth, Staffordshire cannel.
Westmoreland -		6	993	1,242	9,116	Wigan cannel, Arley, South Durham.
Worcestershire -		16	28,575	,609	8,190	Ruabon, Derbyshire, Staffordshire, Yorkshire, Wigan, cannel, Durham.
Wiltshire - -		13	10,094	10,614	7,486	Somerset, Gloucestershire cannel.
Yorkshire, North and East Ridings.		38	65,941	68,222	8,012	Brancepeth, New Silkstone, Flockton new hards, South Durham, Scotch cannel, Yorkshire, Wigan coal and cannel.
,, West Riding		51	344,369	371,902	8,415	
Wales.						
Anglesea - -		2	800	800	8,604	Wigan cannel, North Staffordshire, Runcorn.
Brecnockshire -		—	—	—	—	
Cardiganshire -		2	638	638	8,550	Wigan common and cannel, Norley Orrel.
Carmarthenshire -		2	3,586	3,647	6,500	Welsh.
Carnarvonshire -		6	3,113	3,191	8,263	Wigan cannel, Newcastle, St. Helen's, Welsh, Arley Mine.
Denbighshire - -		6	3,914	4,022	7,526	Mostyn, Flintshire, Wigan, Wrexham, Ruabon, North Staffordshire wall and bench.
Flintshire - -		2	1,516	1,568	7,600	Mostyn common and cannel, Englefield, Bogillt cannel.
Glamorganshire -		10	28,762	31,856	8,930	Welsh, Wigan and Scotch cannel, Monmouthshire, South Wales bituminous coal.
Merionethshire -		2	244	278	8,700	Common Welsh and cannel.
Montgomeryshire -		4	1,410	1,515	7,041	Ruabon wall and bench, Wigan cannel.
Pembrokeshire -		1	500	500	8,000	South Wales.
Radnorshire - -		1	234	217	8,000	Wall and bench.
Channel Islands -						
Isle of Man - -		9	15,927	16,455	9,018	Brancepeth, Newcastle, Cumberland, Scotch cannel.
Isle of Wight -						
Scotland - -		149	263,261	299,919	8,843	Chew coal, Parrot, Scotch and other cannels, steam coal, Dykehead bituminous, Newcastle.
Ireland - -		59	148,463	148,418	8,382	Newcastle, Wigan, Wallsend, Cardiff, Lancashire, Scotch soft and cannel, Cumberland.
Gasworks acting under special Act of Parliament.		45	372,186	360,764	9,468	Yorkshire, Staffordshire, Welsh, Wigan cannel, New Pelton, Pelaw Main, Silkstone, Brancepeth.
Private gasworks -		35	27,069	29,631	8,250	Pelaw Main, Newcastle, Cardiff, wall and bench, Silkstone, Wigan cannel, Brancepeth, Derbyshire, Cannock Chase.
Total -	1,806	1,024	3,612,954	3,811,981	8,300	

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APPENDIX, TABLE No. 151.

WATERWORKS.

RETURN of COALS used at certain WATERWORKS in GREAT BRITAIN.

—	——	Pumping Engines.	Horse Power.	Gallons raised per Day.	Coals used, 1867.	Coals used, 1868.	Description of Coals.
					Tons.	Tons.	
1	Banbury - - -	1	12	150,000	204	204	Slack from house coal.
2	Birmingham - - -	11	—	7,500,000	14,224	15,714	South Staffordshire slack.
3	Brighton - - -	3	420	3,000,000	1,700	1,700	Holywell Main.
4	Cambridge - - -	2	25	430,000	449	372	And 18,000 gallons creosote.
5	Chatham - - -	4	90	500,000	840	1,134	Cramlington and Notts.
6	Cheltenham - - -	4	—	190,000	100	300	Refuse Welsh slack.
7	Chester - - -	3	113	1,083,209	2,267	2,240	Coed Talon, North Wales.
8	Colchester - - -	2	20	220,000	253	258	Slack from seaborne coal.
9	Cross Hill, N.B. - -	1	16	23,000	100	100	Small coal and dross.
10	Deal - - - -	3	20	180,000	200	200	Buddle's West Hartley.
11	Derby - - -	2	110	1,058,344	964	1,005	Minge.
12	Durham - - -	2	50	340,000	819	959	Factory small coal.
13	Exeter - - -	1	32	850,000	109	163	Duffryn steam coal.
14	Gosport - - -	2	45	300,000	—	—	Welsh coal. Aberdare, and Merthyr.
15	Gravesend - - -	3	85	150,000	666	586	Merthyr steam coal.
16	Great Grimsby - -	2	12	180,000	250	300	Hard steam coal.
17	Horsham - - -	1	6	30,000	86	82	Tanfield.
18	Knaresborough - -	3	7	80,000	—	—	No coal employed.
19	Lewes - - -	2	60	330,000	158	165	Coal dust used.
20	Lincoln - - -	2	51	443,000	696	773	North Staveley rough hard.
21	Maidstone - - -	2	66	230,000	462	550	Steam and Welsh coal.
22	Maldon - - -	1	4	12,000	45	45	Small coal.
23	Margate - - -	2	30	400,000	180	220	Best steamcoal.
24	Newcastle and Gateshead -	6	538	6,057,136	9,116	9,327	Unscreened coal.
25	Newport - - -	2	31	80,000	180	180	Tredegar small coal.
26	North Shields - -	3	82	380,000	2,448	2,531	Bellside small coal.
27	Nottingham - -	6	350	2,750,000	3,500	3,500	Derby and Notts.
28	Ramsgate - - -	3	30	300,000	311	320	Nuts and steam, north country coal.
29	Reading - - -	2	12	1,490,000	118	152	Welsh coal.
30	Royston - - -	1	8	20,000	60	60	Hard and cobbles, starclay.
31	St. Alban's - -	1	16	36,000	185	190	Alfreton steam coal.
32	St. Helen's - - -	2	65	600,000	1,039	1,049	Slack.
33	Shrewsbury - -	1	40	520,000	380	476	Cannock Chase rough slack.
34	Southport - - -	2	160	600,000	978	1,010	Burgie from Wigan coalfield.
35	Spalding - - -	2	16	30,000	100	100	Common slack.
36	Stockton - - -	4	240	4,000,000	1,918	1,899	Norwood collieries, near Darlington.
37	Wakefield - - -	2	85	900,000	1,360	1,543	Smudge slack.
38	West Worthing - -	1	8	—	—	300	Small coal and gas coke.
39	Weston-super-Mare -	1	20	120,000	317	295	Slack.
40	Weymouth - - -	1	15	150,000	273	273	Somersetshire coal.
41	Windsor - - -	2	45	600,000	400	500	Bedworth steam coal.
42	Wirral - - -	2	120	330,000	397	533	Wigan burgie.
43	York - - -	2	80	1,334,512	1,413	1,413	St. Helen's, Lancashire.
44	Chelsea - - -	6	600	3,105,785,000	5,538	5,783	Merthyr and Newcastle.
45	Deptford - - -	16	—	6,894,320	5,441	5,983	North country coal.
46	East London - - -	9	450	20,000,000	5,904	6,085	Small coal, Durham, and gas coke.
47	Grand Junction - -	11	1,360	9,724,935	8,330	8,702	Newcastle and Welsh coal.
48	Lambeth (Ditton) - -	7	970	9,693,900	7,225	7,487	Do. do.
	„ (Brixton) -	6	210	2,757,700	1,908	2,004	Do. do.
49	New River - - -	19	1,700	19,862,000	8,741	8,959	Duffryn, Merthyr, and Hirwain.
50	Southwark (Hampton) -	5	400	14,409,576	12,257	12,476	Screenings and Pease's west.
	„ (Battersea) -	6	1,200				
51	West Middlesex (Hampton)	2	105	8,930,031	2,192	2,506	Screenings, seaborne coal.
	„ (Hammersmith)	5	650	8,855,521	5,642	5,620	Do. do.
	„ (Barrow Hill) -	2	40	646,182	352	386	Do. do.
	Total - -	199	10,870	—	112,795	118,712	

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APPENDIX, TABLE No. 152.

AVERAGE PRICES of the BEST COALS at the SHIP'S SIDE, in the PORT OF LONDON, from 1805 to 1865.

—	1805. Per *Chaldron.	1806. Per Chaldron.	1807. Per Chaldron.	1808. Per Chaldron.	1809. Per Chaldron.	1810. Per Chaldron.	1811. Per Chaldron.	1812. Per Chaldron.	1813. Per Chaldron.	1814. Per Chaldron.	1815. Per Chaldron.	1816. Per Chaldron.	1817. Per Chaldron.	1818. Per Chaldron.	1819. Per Chaldron.	1820. Per Chaldron.	1821. Per Chaldron.	1822. Per Chaldron.	1823. Per Chaldron.	1824. Per Chaldron.	1825. Per Chaldron.	1826. Per Chaldron.	1827. Per Chaldron.	1828. Per Chaldron.	1829. Per Chaldron.	1830. Per Chaldron.	1831. Per Chaldron.
January	s. d. 44 6	s. d. 46 2	s. d. 45 2	s. d. 52 0	s. d. 58 0	s. d. 58 5	s. d. 57 4	s. d. 48 5	s. d. 50 10	s. d. 62 4	s. d. 49 11	s. d. 43 5	s. d. 40 9	s. d. 39 3	s. d. 40 0	s. d. 46 2	s. d. 42 5	s. d. 44 0	s. d. 49 10	s. d. 43 8	s. d. 41 10	s. d. 39 5	s. d. 44 8	s. d. 35 10	s. d. 39 11	s. d. 41 1	s. d. 39 6	s. d. 36 9
February	43 6	47 0	41 6	54 2	56 7	49 11	51 2	45 0	49 10	64 5	45 7	40 9	38 10	38 2	42 4	45 10	41 7	42 9	50 9	41 10	39 5	39 8	37 2	38 3	35 9	38 6	35 6
March	41 8	43 11	45 2	51 11	49 3	47 9	48 10	43 4	46 6	78 1	44 10	41 9	38 1	37 7	41 6	44 5	43 5	41 9	48 1	42 1	40 7	38 8	39 7	36 9	34 6	34 3	29 6
April	43 2	44 5	46 0	48 5	50 4	49 6	45 11	44 6	45 6	54 6	43 1	41 1	37 3	40 6	41 1	42 8	43 7	42 4	46 2	44 2	38 9	37 6	38 11	38 11	33 5	35 8	31 11
May	43 9	43 5	44 0	46 11	46 10	51 5	45 10	45 1	50 2	50 9	44 9	39 4	37 4	38 9	40 11	39 9	42 6	40 6	42 1	41 0	38 11	36 11	36 9	38 5	31 10	33 9	36 9
June	42 7	43 0	44 3	45 7	46 9	50 2	44 8	43 6	48 10	53 3	44 8	39 6	39 6	36 8	39 9	40 7	42 8	39 5	43 2	41 2	38 1	35 7	36 6	36 0	32 8	34 7	33 1
July	44 7	44 8	45 6	46 0	53 0	51 1	47 6	43 6	48 3	52 5	44 2	39 4	38 4	37 8	40 0	41 1	42 10	41 2	43 4	40 2	39 9	36 2	36 11	36 8	31 8	34 10	32 1
August	45 10	43 0	45 7	46 0	54 8	51 11	46 4	45 4	48 5	53 4	45 10	39 7	41 2	39 5	40 7	40 4	42 10	41 11	44 8	40 8	40 4	34 2	36 8	37 5	31 11	35 7	31 10
September	44 4	43 9	48 0	47 9	54 11	49 3	45 7	44 3	51 5	56 4	44 11	42 7	41 4	41 8	40 0	42 2	44 0	43 7	44 7	39 11	42 3	36 7	39 2	37 8	34 6	36 7	33 3
October	48 9	47 10	48 0	50 2	60 0	53 2	46 2	43 4	57 0	60 2	56 4	43 9	43 1	44 10	44 0	44 3	46 3	46 10	46 2	43 6	44 0	36 2	41 9	40 0	37 10	37 1	33 9
November	48 7	44 3	45 1	50 4	63 9	53 7	44 7	44 0	60 6	61 7	49 4	45 7	43 9	42 0	46 3	44 4	46 3	45 8	46 5	41 2	44 8	36 0	41 2	39 10	36 4	36 3	35 1
December	47 0	41 9	51 3	51 4	60 7	53 9	48 0	48 0	62 5	61 11	49 7	42 1	44 9	41 1	45 5	43 5	45 9	46 4	46 3	40 4	43 3	36 0	39 9	38 2	39 1	39 6	32 2
Average Price	44 9	44 5	45 10	49 3	54 6	51 8	47 8	44 10	52 5	59 1	46 9	41 8	40 4	39 10	41 10	42 11	43 8	43 0	46 3	41 8	41 0	37 4	38 6	38 2	35 1	36 4	33 6
Duty paid to Government	9 4	9 4	9 4	9 4	12 6	12 6	12 6	13 6	12 6	12 6	9 4	9 4	9 4	9 4	9 4	9 4	9 4	9 4	9 4	0	6 0	6 0	6 0	6 0	6 0	6 0	6 0

—	1832. Per Ton.	1833. Per Ton.	1834. Per Ton.	1835. Per Ton.	1836. Per Ton.	1837. Per Ton.	1838. Per Ton.	1839. Per Ton.	1840. Per Ton.	1841. Per Ton.	1842. Per Ton.	1843. Per Ton.	1844. Per Ton.	1845. Per Ton.	1846. Per Ton.	1847. Per Ton.	1848. Per Ton.	1849. Per Ton.	1850. Per Ton.	1851. Per Ton.	1852. Per Ton.	1853. Per Ton.	1854. Per Ton,	1855. Per Ton.	1856. Per Ton.	1857. Per Ton.	1858. Per Ton.	1859. Per Ton.	1860. Per Ton.	1861. Per Ton.	1862. Per Ton.	1863. Per Ton.	1864. Per Ton.	1865. Per Ton.
January	s. d. 23 2	s. d. 19 7	s. d. 19 7	s. d. 23 3	s. d. 22 8	s. d. 24 7	s. d. 25 3	s. d. 23 8	s. d. 24 2	s. d. 25 0	s. d. 22 10	s. d. 20 9	s. d. 20 3	s. d. 23 8	s. d. 18 11	s. d. 26 7	s. d. 24 2	s. d. 17 4	s. d. 19 10	s. d. 16 2	s. d. 17 6	s. d. 18 11	s. d. 37 9	s. d. 23 7	s. d. 20 4	s. d. 19 4	s. d. 21 2	s. d. 19 0	s. d. 20 1	s. d. 23 11	s. d. 17 11	s. d. 18 6	s. d. 22 7	s. d. 20 4
February	22 0	17 0	18 4	23 3	23 10	24 11	27 1	23 5	24 0	25 6	21 6	20 0	19 8	20 5	17 2	22 7	19 3	16 4	18 11	15 9	16 6	19 6	28 4	25 9	18 5	18 3	18 5	18 3	20 4	21 5	16 11	17 1	19 5	21 4
March	22 11	19 9	18 3	21 11	21 11	25 4	27 4	23 9	24 6	23 4	21 2	19 8	20 3	20 6	16 0	20 8	17 0	16 7	17 5	15 5	15 11	19 11	31 5	20 7	17 9	17 5	18 8	17 1	20 9	19 8	16 10	17 3	18 11	20 6
April	23 3	20 9	20 11	21 9	23 0	25 5	24 1	24 4	23 4	23 3	21 5	20 8	22 7	19 6	18 1	19 3	16 10	19 1	18 1	15 7	16 1	19 1	19 2	20 2	18 2	18 8	18 6	17 9	21 3	18 9	17 6	17 3	19 11	19 5
May	23 3	16 7	18 8	21 2	21 8	23 1	22 11	22 10	22 6	22 2	20 8	20 5	22 1	18 9	16 10	19 2	16 7	17 0	16 6	15 4	16 1	18 1	19 6	19 10	18 1	17 8	17 4	18 2	18 0	17 10	16 5	16 8	17 7	17 11
June	20 11	15 10	19 9	19 11	21 5	22 6	22 10	23 7	23 1	21 6	20 6	20 4	23 0	17 9	15 2	18 2	16 5	16 7	16 1	14 6	16 0	16 5	20 4	21 0	17 8	17 2	17 0	17 6	18 5	18 7	16 8	17 1	17 5	17 9
July	21 6	15 8	20 1	21 0	21 9	23 2	23 0	23 1	23 11	20 9	20 9	20 4	24 4	17 4	15 11	18 8	16 4	17 4	16 2	14 9	15 9	17 8	21 1	21 5	18 11	18 1	17 4	17 6	18 9	19 4	17 2	17 7	18 8	19 3
August	21 8	16 6	20 4	21 3	21 9	23 4	23 6	23 2	23 0	21 3	20 4	19 9	23 2	18 4	15 9	19 4	17 4	17 9	15 8	15 1	15 5	19 8	23 6	22 2	19 0	18 5	17 8	17 2	19 0	18 9	17 4	18 1	19 0	20 0
September	22 1	18 6	21 6	21 6	23 8	24 2	23 8	23 7	23 3	20 2	20 3	18 8	23 4	18 10	17 9	21 1	17 5	17 4	16 5	15 8	16 0	24 6	22 10	23 6	19 5	18 6	17 11	18 4	18 10	18 9	17 8	18 6	20 5	20 6
October	22 4	19 6	22 7	22 6	25 3	24 1	24 7	24 4	24 4	21 10	21 11	20 7	23 9	19 4	20 4	21 6	18 7	19 7	16 8	17 0	17 10	24 4	25 0	23 2	19 7	21 0	19 2	18 10	20 8	19 2	18 6	20 7	21 4	22 10
November	22 6	20 8	23 0	23 8	26 2	24 2	25 3	24 5	24 1	22 6	21 3	21 0	23 4	18 2	20 10	21 0	19 1	18 4	16 0	19 1	18 0	24 10	24 4	22 6	20 0	20 3	19 5	20 1	23 4	20 0	19 8	19 6	22 10	21 3
December	19 11	19 1	23 8	22 9	24 6	25 9	24 8	24 4	24 8	21 8	21 4	20 2	27 0	17 10	22 5	22 3	18 8	19 1	16 11	18 8	17 4	31 2	22 3	22 6	19 4	19 5	18 9	20 5	22 10	18 0	18 6	20 2	23 3	21 1
Average Price	21 11	18 3	20 6	21 11	22 11	24 0	24 6	23 8	23 7	22 4	21 2	20 2	22 10	19 2	17 11	20 10	18 2	17 8	17 1	16 1	16 6	21 2	23 9	21 11	18 11	18 8	18 5	18 4	20 1	19 6	17 7	18 2	20 1	20 2
Duty paid to Government	Free.																																	

* The London Chaldron of 25½ cwts., or, as it was called, the Imperial Chaldron, was rather less than half of the Newcastle Chaldron of 53 cwt. They were to each other as 8 to 17.

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PRICES OF COAL

Prices of Coal from 1635 to 1795.

1655, 11/ per chaldron at Newcastle.
Charles I., 13th year, 11/4 per chaldron at Newcastle.
1635, 10/ per London chaldron in London.

1653, 20/	do.	do.
1665, 13/	do.	do.
1761, 24/9½	do.	do.
1768, 36/	do.	do.
1775, 38/	do.	do.
1785, 40/	do.	do.
1795, 42/6	do.	do.

See table on previous page for prices of coal from 1805 to 1865.

An Account of the Prices of Coals in the London Coal Market on the following Market Days, viz., April 30, May 3, 1830, and April 29, May 2, 1831.

Friday, April 30, 1830.

Newcastle.

Adair's, 29/
Bishop Main, 26/6
Dean's Primrose, 28/
East Percy, 26/
Felling Main, 26/9
Hebburn, 31/
Holywell, 30/
Pelaw, 29/6
Pontop Windsor, 25/
Shipcote, 27/
Tanfield, 30/
Tanfield Lea, 27/6
Townley, 27/9
Wylam, 30/
Wallsend :—
Burraton, 31/–31/6
Bell Robson, 32/
Bewicke, 32/9
Clark, 30/
Carr, 28/9
Cramlington, 26/6
Callerton, 30/
Heaton, 31/9
Hilda, 30/6
Hotspur, 31/
Newmarch, 32/3
Perkins, 31/
Riddell's re-shipped, 30/
Russell's, 32/3
Walker, 32/6

Sunderland.

Lambton Primrose, 30/3
Wallsend :—
Stewart's, 33/9
Russell's Hetton, 34/

Blyth, &c.

Cowpen, 27/6
Hartley, 29/
Silkstone, 28/
Wallsend, Elgin, 28/6

Traders.

Holywell, 30/

Small Coal.

Stobart's, 22/
Old Etherley, 18/
Wallsend, Perkins, 17/6

133½ ships at market.
29½ „ sold.

104 remaining.

Monday, May 3, 1830.

Newcastle.

Adair's, 29/
Beaumont, 27/6
East Percy, 26/6
Hebburn, 30/
Killingworth, 30/
Orde's Redheugh, 25/9
Pelaw, 29/6
Pontop Windsor, 25/
Tanfield, 29/6
Tanfield Lea, 27/6
Townley, 27/9
Willington, 31/6
Wylam, 30/
Wallsend :—
Burraton, 30/3
Bell and Brown, 32/
Bell Robson, 31/6
Bewicke, 32/3
Boundary, 27/
Clark, 29/
Cramlington, 26/
Callerton, 29/6
Gosforth, 32/6–32/9
Heaton, 31/6–31/9
Hilda, 29/6
Hotspur, 30/3
Newmarch, 31/3
Northumberland, 30/
Peareth, 28/
Perkins, 30/
Riddell's, 31/6
Russell's, 31/9
Walker, 32/

Sunderland.

Fawcett Main, 27/
Lambton Primrose, 30/3
Wallsend :—
Hetton, 33/–33/3
Lambton, 33/3
Lyons, 31/6
Stewart's, 33/–33/3

Stockton.

Eden, 28/

Blyth, &c.

Cowpen, 27/
Halbeath, 27/
Hartley, 30/
Silkstone, 28/

Traders.

Wallsend, Hetton, 32/6

Small Coal.

Ellison, 21/
Tyne, 20/

105¾ ships at market.
51¼ „ sold.

54½ remaining.

Friday, April 29, 1831.

Newcastle.

Adair's, 26/
Beaumont, 24/6
Dean's Primrose, 24/6
Hebburn, 28/
Holywell, 27/
Killingworth, 29/
Liddell's Main, 22/
Orde's Redheugh, 23/
Shipcote, 22/6
Tanfield, 26/6
Townley, 26/
Willington, 30/3
Wallsend :—
Bell Robson, 29/
Bewicke, 33/
Gosforth, 32/6
Northumberland, 28/
Pearith, 23/
Perkins, 28/
Russell's, 31/6
Walker, 31/6

Sunderland.

Eden Main, 28/3–28/6
Wallsend :—
Hetton, 35/
Lyons, 31/6

Stockton.

Wallsend, Tees, 31/

Blyth, &c.

Cowpen, 23/
Llangennech, Pemb., 32/
Llannelly, Warde's, 31/
Wallsend :—
Elgin, 22/
Henderson, 21/6

Traders.

Liddell's, 22/

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SMALL COAL.

Wallsend, 18/

125¾ ships at market.
16 „ sold.

109¾ remaining.

Monday, May 2, 1831.

NEWCASTLE.

Adair's, 26/
Beaumont, 24/6
Dean's Primrose, 24/6
East Percy, 23/6
Earsden Main, 25/
Hepburn, 27/
Holywell, 26/
Killingworth, 28/
Liddell's, 22/3
Orde's Redheugh, 22/6
Pontop Windsor, 23/
Tanfield, 25/6
Townley, 26/
Willington, 28/
Wallsend:—
Bell and Brown, 28/6–29/6
Heaton, 31/
Northumberland, 27/6
Perkins, 28/
Riddell's, 31/
Walker, 30/6

SUNDERLAND.

Eden Main, 27/6
Russell's Lyons Main, 29/
Wallsend:—
Hetton, 35/
Lyons, 30/6
Stewart's, 35/

STOCKTON.

Wallsend:—
Norwood Hetton, 27/6
Tees, 30/6–31/

BLYTH, &c.

Cowpen, 23/
Haibeath, 21/6
Hartley, 26/
Llangennech, 35/
Ditto, Pemberton, 32/
New Flockton, 23/
Warde's Llannelly, 31/

TRADERS.

Liddell's, 22/
Wallsend, Lyons, 30/

112¾ ships at market.
21¼ „ sold.

91½ remaining.

FRAGMENTARY RETURNS of the PRICES of COAL at PIT'S MOUTH previous to 1868.

NORTHUMBERLAND and DURHAM, 1867, 1868.

Gosforth and Killingworth, 9/ screened (2nd quality in London market.)
Hartley best steam, 8/6.
Gas coal (best), 5/6 unscreened.
Coking coal, 4/9 do.
(These prices differ but little from the prices of 1855; recent reductions have brought prices down to what they formerly were.)

CUMBERLAND.

1851, average house at pit's mouth, 4/6 per ton.
1856 „ „ 6/ „
1859 „ „ 5/8 „
1864 „ „ 6/10 „
1866 „ „ 8/ „
1868 „ „ 6/ to 6/6 per ton.

YORKSHIRE, 1868.

Fenton Park or Victoria Colliery, 6/9.
Haywood Place Colliery, black band, 7/6; red shaft, 6/.
Park Gate, hard, 6/6; house, 6/6; soft house, 5/ to 6/; cobbles, 4/6.
Thorncliff thin coal, 8/.
Silkstone, hard, 9/, picked; soft and hard, 8/; nuts, 5/6; gas, 6/.

BARNSLEY.

Darfield Main, house, 7/3; steam, 6/6; nuts, 3/; unscreened, 4/3; pit slack, 3/, 3/1, to 5/; coke, 3/4; hard, 7/ to 7/6; soft house, 6/.

DERBYSHIRE and NOTTINGHAM, 1868.

Hard, 6/6 to 7/; soft, 6/.

LEICESTER, 1868.

6/6 to 7/.

LANCASHIRE, 1867.

Laid down at Ashton-under Lyne, 1867:—1st half, 8/11; 2nd half, 8/1; 1868, December, 6/3.

A LIST of the SELLING PRICES of COAL at the BRIDGEWATER TRUSTEES' COAL WHARF at CASTLEFIELD, MANCHESTER, from 1841 to 1866.

Date when rate commenced.	Unriddled coal per ton.	Date when rate commenced.	Dixon green coal per ton.
	s. d.		*s. d.*
1841, July 13	6 8	1838, December 22	12 6
1842, February 5	6 3	1843, November 25	13 4
1843, September 16	6 0	1847, August 2	11 8
„ October 9	6 10	1848, June 24	10 10
1844, January 22	7 3	„ September 7	10 0
1845, March 10	7 8	1850, January 11	10 10
1847, June 25	6 10	„ August 11	10 0
1848, June 24	6 3	1851, December 1	10 10
„ December 2	6 0	1852, November 1	11 3
1850, January 11	6 10	1853, June 6	12 1
„ April 22	6 5	„ September 26	12 6
„ May 16	6 0	„ October 12	13 4
„ July 1	5 9	1856, July 1	12 6
1851, December 1	6 4	„ „ 14	11 7
1852, February 5	6 0	1857, October 1	12 6
„ November 1	6 6	1858, March 1	11 8
1853, June 6	7 4	1859, December 1	12 6
„ October 12	7 6	1860, April 2	13 4
1855, April 2	7 1	„ October 1	13 9
1856, March 1	6 8	„ December 6	14 2
„ April 15	6 3	1861, November 9	13 4
„ July 14	5 6	1862, February 20	12 6
1857, October 1	5 11	1863, July 13	11 8
1858, March 1	5 6	„ November 2	12 6
„ March 5	5 2	„ December 7	13 4
„ December 2	5 6	1865, June 1	12 6
1859, January 14	5 9	1866, November 1	13 4
„ December 1	6 7	„ December 1	14 2
1860, March 19	7 5		
„ October 1	8 3		
1861, June 1	7 5		
1862, February 1	6 7		
1863, July 13	5 9		
„ November 2	6 2		
„ December 7	6 7		
1865, October 2	7 5		
„ December 1	8 3		
1866, November 1	9 2		

SOUTH STAFFORDSHIRE, 1866.

Haden Hill, Dudley, 5/5 per ton.
Tipton Hall, Tipton, 8/6 per ton.
Bentley Bridge, four-fifths at 6/9; remainder at 9/.
Brenton and Hayes, 10/10, 8/4, 5/10.
Hitchens, Moxley, Old Hall, 18,000 at 8/; 9,000 slack at 3/.
The Lye, Stourbridge, 5/.
Swan, West Bromwich, 12/, 10/, 8/; slack, 2/6.
Hatherton, 6/.
The Monkfield, Willenhall, 6/9.
Bird's Lesser, 7/.
Hedensford, 7/.
Springfield, Oldbury; coals, 10/; lumps, 8/8; slack, 3/6.
Lunt's, 7/.
Wingshall and Spring Vale, 8/6.
Hurst, Tipton, coals 10/; slack, 4/.
Bromsfield, near Stafford, large, 9/; lumps, 8/; slack, 2/6.
Wyrley, near Cannock, 8/.
Spon Lane, West Bromwich, 4/, 4/6, 5/, 9/, 10/, 11/, 12/, 14/.
Pool Hayes, 7/; slack, 2/6.
Cannock and Rugeley, large, 7/6; lumps or cobbles, 5/6.
Homer Hill, Cradley, average, 6/; slack, 3/, 3/6.

1867 and 1868.

Cannock and Rugeley, deep coal, 9/6; lump, 8/6; spires, 7/; shallow coal, 8/6; lump, 7/6; oneway, 7/; screened slack, 5/; hard, 6/6. Mr. Johnson says 6/ per ton will be right for all coal, lumps and slack, from Brooch coal down to Cannock Chase deep coal).

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Cannock coal, deep, 10/6; yard, 10/; shallow, 8/; hard, 7/; slack, 4/.
Minton's colliery, heather, 11/, 10/; brooch, 11/; two-feet, 9/, 8/; thick coal, 11/; slack, 4/6.
Willinghall, 10/ to 11/; skinks, 5/ to 6/; New Mine, 7/ to 7/6; fire-clay coal, 6/6 to 7/; bottom, 6/ to 7/; mealy grey, 6/.
Wednesbury, Bilston, Willenhall, Pool Hayes, and Essington, 8/ to 10/ on bunk.
Ash Tree, Old Hill, best thick, 13/; second, 10/; common, 9/; rough slack, 8/; black coal, 7/; screenings, 5/6; fine slack, 3/6; brooch coals, 10/; brooch slack, 3/6; brooch fine, 4/.
Conduit Colliery, Walsall, deep coal, 10/; ditto lumps, 8/6; ditto slack, 3/6; shallow coal, 8/6; ditto slack, 3/6.— (in 1858). Deep coal, 11/; ditto lumps, 10/; ditto slack, 5/, 4/; shallow coal, 9/6; ditto lumps, 8/6; ditto slack, 5/, 4/; yard, 9/.—(1868).
Cannock Chase, deep coal, 10/; ditto slack, 5/; shallow coal, 7/11; hard steam, 7/6; yard, 8/9; yard slack, 4/2.
Corbyn's Hall, rail brooch, 10/; cannel brooch, 11/; kibbles, 6/; fine slack, 3/; best thick, 11/; common thick, 9/; slack, 3/.
Ladymoor, best thick, 14/; common thick, 10/; slack, 4/6; lumps, 9/; fine slack, 2/.
Freeman's, Kingswinford, thick and rough, 7/6; fine slack, 2/; brooch lumps, 9/; kibbles, 5/; fine slack, 2/; heather, 7/6; fine slack, 2/.
Old Buffers, best, 10/; common, 9/; rough slack, 3/6; lumps, 8/.
Conegre, Tipton, best, 15/; common, 13/; black coal, 8/; lumps, 9/; E. slack, 4/6; fine slack, 2/9.
Windmill End and Baptist End, thick, 9/; lumps, 8/; kibbles, 6/; slack, 3/; brooch, 10/, 9/; kibbles, 6/; slack, 3/6.
Round Oak, best, 13/; common, 9/; best lumps, 8/; black, 7/; screenings, bright, 5/6; screenings, black, 4/6; brooch, 10/; screenings, 7/; slack, 3/6.
Salt Wells, best, 13/; common, 9/; best lumps, 8/; black, 7/; screenings, bright, 5/6; slack, 3/6.

Staffordshire, 1869.

Earl Dudley's thick coal, best, 11/6; seconds, 7/8; lumps, 6/8; screenings, 4/8; engine slack, 3/.
Black coal, best, 6/; screenings, 4/8.
Heather, best, 11/6; lumps, 6/8; screenings, 4/8.
Brooch, mixed, best, 8/6; screenings, 6/.

Warwickshire, 1867, 1868.

Two-yard coal, best, 9/; seconds, 8/; hard, 7/; cobbles, sorted, 7/6; cobbles, screened, 6/; cobbles, mixed, 4/; slack, 3/.
Slate coal, best, 9/6; seconds, 8/6; hard, 7/; cobbles, sorted, 7/6; cobbles, screened, 6/; cobbles, mixed, 4/; slack, 3/.
Ryder coal, best, 7/6; slack, 3/.
Seven-feet coal, best, 10/; seconds, 9/; soft, 6/6; cobbles, sorted, 7/6; slack, 3/.

Shropshire, 1868.

Old Park, tops, 10/4; doubles, 8/6; yards, 8/6; big flint, 9/6 to 10/; new mine, 6/6; two-feet, 8/; little flint, 10/4.

Gloucestershire and Somersetshire, 1867 and 1868.

Easton and Whitehall, at pit, house, 13/, 11/6, 10/; steam, small, 5/ to 6/; factors brush, 9/ to 10/. Cartage, Bristol, 2/; Clifton, 3/.
Hope Lane, house, 6/.
Pennywell Lane, house, 7/6.
Bedminster, screened, 10/6; black (picked lumps), 13/; largest quantity sold as screened.
Ashton Vale, slack, 5/; 5/ for all coal used at Ashton furnace.

Ruabon, 1864.

Wall and bench coal, 9/2 per ton.
Rough slacks, 6/ per ton.
Fine slacks, 3/3 per ton.

North Wales, 1868.

Quinta, Ruabon, 8/4, 7/6, 6/8, 5/, 4/2.
Ashton Hall, Hawarden, rough and brassy, average, 6/6; slack, 3/4.
Queen's Ferry, Hawarden, rough and brassy, average, 7/6; slack, 4/.
Pentorbin, Buckley, holeins and rough, 6/8; slack, 2/ to 3/4.
Ewloe Hall, main, 6/8, 6/7; slack 2/6, 2/2.
Vron, average, 6/6; slack, 3/.
Little Mountain, yard coal, 7/6; main, 7/; holeins, 6/6; slack, 3/4.

South Wales.

Cardiff, steam, 7/, 8/. The prices at pit's mouth would be from 2/3 to 2/6 less than when delivered at Cardiff.
Sims, Williams, and Co., shipping at Llanelly and Swansea, large steam, 9/; through, 6/9; small, 2/9; house, large, 9/6; house, through, 7/; smiths', 6/3; mining, 5/6.
Dowlais collieries, large steam, 8/; through, 6/6; upper four foot, 7/6, 8/.
Rhonda, small No. 3, 6/; No. 3, 8/6; No. 2, 8/; small No. 2, 5/.
Rhonda Brush, steam, 9/6, 11/6; No. 3, 7/6; No. 2, 7/.
Abergorki, steam, 5/6. Delivered free on board at Cardiff about 3/ more than at pit bank.
Mr. G. B. Strick, steam, 6/; bituminous, 8/ large, 4/ small.
Ditto, steam, 6/; small, 1/6.
Birch Grove, steam, 8/6 average.
Pantyffynnon, steam, 7/6; through and through, 5/6; small, 3/6. At Llanelly, 8/6; 6/6; 4/6.

Anthracite.

Large, 6/6; small or culm, 2/9.
Pembrokeshire, best, 13/.
Pantyffynnon, large stone coal, 9/3; pit's mouth at Llanelly, 11/.
Through and through, 6/3 „ „ 8/.
Rubbly culm, 3/9 „ „ 5/6.

Average Prices realized in Cardiff.

Year.	House Coal.		Steam Coal.	
	Large.	Small.	Large.	Small.
	s. d.	s. d.	s. d.	s. d.
1858	8 6	6 6	8 6	2 6
1859	8 6	6 3	8 6	2 9
1860	8 9	6 3	8 9	2 0
1861	9 0	6 3	*9 0	1 6
1862	9 0	6 0	9 0	2 0
1863	9 0	6 3	8 9	3 0
1864	9 3	6 3	10 6	4 0
1865	9 3	6 0	11 6	4 0
1866	9 0	5 6	12 0	4 6
1867	8 6	5 3	10 6	4 0
1868	8 0	5 0	9 6	2 6
	96 9	65 6	106 6	32 9
	8 9·59	5 11·45	9 8·18	2 11·72

* Screening at port of shipment commenced. This process reduced the 2s. to 8s. 6d. as compared with 1860. From 1861 the prices are those obtained for extra screened coal.
N.B.—The whole of the above are subject to 2½ per cent. discount for cash, which is the rule of the trade. House coal does not realize as much by 4d. per ton compared with steam coal as this appears to show, inasmuch as trimming and wharfage is paid by the ship on steam coal, but borne by the colliery proprietor on house coal. The above prices refer to the No. 2 Rhonda house coal seams; No. 3 seam realised 6s. to 9d. more, and Lantwit about 2d. per ton more. Lantwit small would fetch about 2s. per ton less.
For steam coals of a fair average quality these were the prices obtained; inferior or semi-bituminous coals fetched 6d. to 9d. less. Very prime qualities 6d. more.

Glasgow.

Reply by one of the Inspectors of Collieries to an Inquiry respecting Prices.

1868.

The following are the prices of coal at collieries which, in my opinion, convey an average idea of the sales of the district:—
At Colliery A. two qualities of coal were sold—
In October 1853, 6/8 per ton (20 cwt.); 8/ per ton.
„ 1868, 4/9 „ „ 5/6 „
At Colliery B. three qualities of coal were sold—
In October 1853, 7/6 per ton; 5/9 per ton; 4/6 per ton.
„ 1868, 5/6 „ 4/3 „ 3/3 „
At Colliery C. the sales for landsale and shipping were—
In 1849, for landsale, 3/8 per ton; for shipping, 3/4 per ton.
„ 1868 „ 5/ „ „ „ 4/6 „
The workmen's wages rule the selling price to a great extent, and you are aware that the colliers' wages fluctuate very much. In 1853 wages were high; in 1849 they were low. At present wages are neither high nor low, but trade is bad.

Mean Average Annual Prices of Coal in the London Coal Market from 1866 to 1869.

Collieries.	1866.	1867.	1868.	1869.
	s. d.	s. d.	s. d.	s. d.
Wallsend	17 9	18 3	15 9	15 9
Tanfield	15 6	—	—	—
Hartley	17 0	17 8	15 8	15 8
Wylam	—	17 3	15 0	—
Eden Main	18 3	18 8	16 4	16 7
W. E. Kelloe	18 6	18 9	16 6	16 9
Holywell Main	—	—	—	15 9

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1870.

PRICES of COAL per ton at the PIT'S MOUTH in each of the following Districts.

NORTHUMBERLAND.

Seasale Collieries.

Ashington, best, 3/6; small, 1/1.
Bishop's Hill, 7/, 5/, 3/.
Cramlington, best, 8/6; unscreened, 7/; gray, 6/; small, 2/6.
East Castle, 3/10.
North Wylam, 4/6.
Radcliffe, 5/4.
Sheriff Hill, 8/6.
South Medomsley, 3/9.

Landsale Collieries.

Berwick Hill, 7/6.
Eltringham, 5/.
Etal, 7/.
Hedley, 5/6; small, 3/.
Preston, 2/6 to 6/8.
Shilbottle, round, 9/2; small, 3/4.
Winlaton, 4/.

DURHAM.

Tyne District.

Burnhope, 5/.
Edmondsley, for coking, 3/6; gas, 4/3; house, 5/.
Findon Hill, 3/6.
Pelton West, 6/6.

Tees District.

Bilchburn, 3/9.
Bilchburn West, 4/3.
Castle Eden, 5/.
Cockfield Fell, 3/2.
East Howle, screened, 6/; nuts, 3/9; small, 2/6.
Hamsteels, 4/ to 4/4.
Trindon Grange, 4/1.
Tursdale, 4/2.

CUMBERLAND.

Broughton Moor, 8/4, 7/6, 6/8, 5/, 3/4, 2/6.
Flimby, best coal, 5/9.
Frizzington, 7/6.
Gillhead, 6/8, 5/10, 5/, 3/4.
Harrington, 10/.
Threapthwaite, round, 9/2; small, 3/4.

YORKSHIRE.

Barnsley.

Bloomhouse Green, hards, 7/; house, 6/; engine, 4/; slack, 1/6.
Darton, 4/3.
New Gawber Hall, hards, 8/; soft house, 5/6.
Strafford, average price, 6/.
West Gawber, 5/.

Bradford.

Bowling, best, 9/; seconds, 7/6 and 5/.
Heaton (Shipley), 7/6.
North Cliff, 3/8.
Shipley Moor, 6/6.
Shipley, 6/.
Wibsey, 7/.

Dewsbury.

Calder, 5/.
Cross Bank, 6/10.
Falhouse, 4/4.
Liversedge, 5/6.
Mirfield, 5/.
Whilley Wood, 5/.

Halifax.

Binns Bottom, 5/.
Dickey Steel, house coal, 7/6; mill coal, 7.
Four Lane End, house, 8; engine, 6/.
Harp Bottom, 7/6.
Highfield, 6/6.
Queensbury, from 5/6 to 9/7.
Shugden Head, house, 7/6; engine, 5/9; slack, 2/6.

Huddersfield.

Box Jugs, 5/6 and 6/.
Clayton Common, 2/ to 4/8.
Cumberworth, house, 7/6; engine, 5/.
Fieldhouse, 7/6.
Kirk Style, 3/9 to 7/.
Lockwood Common, 6/.
Toppit, 6/.

Holmfirth.

Barnside, 5/.
Gatehead, 5/.
Meltham, 5/.

Leeds.

Adwalton Moor, 5/.
Beeston, best, 8/, 7/6, 6/4, 4/, 3/6, 2/7, 2/6.
Britannia Main, 5/, 6/8, and 7/6.
Brook House, 4/6.
Bushey, 1/3 to 8/4.
Elland Road, 4/2.
Garforth, 2/6 to 9/.
Gildersome, 5/.
Manslow, best, 8/, 6/; slack, 2/9.
Middleton, best, 5/ to 7/6; slack, 2/6.
Morley Main, 1/6 to 9/6.
Newmarket, 1/3 to 8/4.
Robert Town, 4/4.
Stanley, average, 5/4.
Victoria, 4/.
York Road, 7/ to 9/, house; engine, 2/ to 5/.

Rotherham.

Grange, 7/.
Grange Lane, 9/.
Greenfield, 6/.
Manvers Main, best, 6/8; slack, 3/; smudge, 1/.

Sheffield.

Chapeltown, 5/.
Deepcar, 5/6.
Elder Cliff, 4/6.
Stocksbridge, 5/.
Thurgoland, house, 5/; engine, 2/7.
Woodthorp, 5/9.

Wakefield.

Dewsbury Lane, 4/6.
Dirtcar, 3/.
Emroyd, 6/.
Flockton, 6/.
Manor, 5/6.
West Field, best, 6/8; small, 5/4; engine, 4/2; slack, 2/4.
Winney Moor, best, 8/11; seconds, 8/5; thirds, 6/10; riddled slack, 5/11; slack, 3/6; and smudge, 2/6.

DERBYSHIRE.

Chesterfield.

Brimington, 6/6.
Coal Aston, 6/.
Eckington, 5/.
Falls Wood, 5/4.
Monk Wood, 6/ to 9/.
Oxclose, best, 6/8; slack, 5/.
Renishaw, average, 6/8.
Walton Hall, coal, 5/9; slack, 3/.
Pilsley Colliery Company, 5/6; cobbles, 4/6; slack, 3/6.
Woodhouse, hard, 7/6; soft, 7/1; small, 4/7.

Alfreton.

Coates Park, screened slack, 5/ to 5/6; cobbles, 6/ to 7/; bright, 8/ to 8/6.
Shirland, round, 5/6 to 8/.
Swanwick, 5/ to 12/.

WARWICKSHIRE.

Bedworth, average, 6/9.
Glascote, best, 10/; slack, 2/6.
Griff, average, 7/6.
Peel, best, 6/8; slack, 3/4.
Wyken, best, 6/2; slack, 3/4.

STAFFORDSHIRE, NORTH.

Cheadle.

Lady's Well, best, 8/4; slack, 4/2.

Longton.

Bentilee, average, 6/1.
Berry Hill, 6/.
Botteslow, best, 7/; slack, 2/3.
Hall Hill, average, 6/10.
Ubberley Hall, coal, 7/6; slack, 2/6.

Hanley.

Bucknall, New, 8/ and 9/2.
Ivy House, 7/6.

Burslem.

Bank Top, coal, 6/8; slack, 2/8.
Chell, average, 7/6.
Lytch Cross, for calcining, 5/6.

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Newcastle-under-Lyne.

Apedale, from 6/ to 10/.
Greenfield, &c., coal, 7/; slack, 2/6.
Harecastle, 4/6.
Millbank, 6/8.
Woodshutts, 4/6.

STAFFORDSHIRE, SOUTH.

Rugeley.

Cannock Chase, average, 7/4.

Wyrley.

Conduit, average, 7/.
Old Brownhills, 6/.

Walsall.

Copy Hall, 8/4.
Fishley, 11/, 10/, 9/, 6/3, 4/6, 3/6.
Harden, best, 7/; slack 3/ and 2/9.
Leamore Bridge, average, 7/.
Pelsall, deep, 9/; shallow, 7/6; slack, 3/.
Roughwood, 7/3.

Darlaston.

North-western, 7/6.
Rough Hay, summer, 6/; autumn, 6/6; winter, 7/.

Bilston.

Bradley Lodge, coal, 9/3; slack, 3/3.
Deepfields, 8/; slack, 2/6.
Ladymoor, best thick, 14/; common, 9/; slack, 4/.
Meadows, 7/6.
Priestfield, 4/1, 5/7, 8/6, 10/; slack, 1/2.
Quarry, 6/6; slack, 2/.

Willenhall.

Albion, coal, 6/6; slack, 2/.
Pool Hayes, forge, 5/6; house, 8/6; slack, 2/6 and 3/9.
Rose Hill, coal, 7/; slack, 2/.
Trentham, coal, 7/3; slack, 2/.

Wolverhampton.

Wednesfield, 8/.
Willenhall Road, 8/.

Sedgeley.

Coopers Bank, coal, 9/.
Graveyard, coal, 7/.
Sedgeley Park, coal, 6/9 and 7/.

Tipton.

Gospel Oak, 15/, 11/, 10/, 9/, 5/, 3/9, 3/6, 3/.
Moal, coal, 15/6; slack, 2/6.
Tibbington, coal, 9/ and 4/6.

Rowley Regis.

Grace Mary, 7/.
Granville, average, 5/.
Hange, 13/, 11/, 10/, 9/, 8/, 5/6, 4/6.
Haden Hill, average, 5/6.
Manor House, coal, 6/8 and 8/; slack, 3/.

West Bromwich.

Dunkirk, coal, 9/6; slack, 2/6.
Harvills, coal, 8/6, 11/, 13/; slack, 4/, 5/, 5/6.
Piercey, coal, 10/ to 11/; slack, 4/ to 5/.

Wednesbury.

Ocker Hill, coal, 7/, 10/6, and 12/; slack, 3/11.
Ola Park, coal, 7/6; slack, 3/.
Steers Meadow, coals, 10/; slack, 4/.

Corngreaves.

Ash Tree, coal, 6/3.
Cradley Heath, coal, 8/; slack, 2/6.
Homer Hill, coal, 5/6.
Hay Green, coal, 8/6.

Dudley.

Baptist End, coal, 10/; slack, 4/.
Hurst, coals, 9/ to 10/; slack 2/6 to 3/6.
Queen's Cross, coal, 9/4; slack, 3/6.

Brierley Hill.

Amble Cote, best, 10/6; common, 8/6; rough slack, 7/6; fine slack, 2/9.
Bridge End, coal, 5/9.
Challershall, coal, 7/6.

LANCASHIRE.

Manchester District.

Altham, coal, 6.
Bank Hey, coal, 5/8.
Birtle Dean, coal, 7/6.
Breightmet, house, 7/6; engine, 4/9.
Broadfield, coal, 5/9, 8/, 12/6.
Combermere, coal, 4/6.
Crowknowl, coal, 6/3.
Denton, round, 7/; engine, 4/6.
Dunkenhalgh Park, average, 6/6.
Great Lever, best, 10/; mixed, 8/; steam 5/.
Harwood, house, 7/6; steam 5/.
Ladyshore, average, 4/4.
Lower Moor, best, 10/6; small, 6/.
Old Sink and Greenland, 5/4, 6/4, 7/, and 8/8.
Redsham, 5/ to 8/4.
Stand Hill, 5/3.
Wharton, best, 6/8; riddled, 5/5; burgy, 3/9; slack, 2/6.
Tyldesley, 8/9, summer; 9/7, winter.

Saint Helen's.

Average prices from 4/6 to 5/6 per ton.

Wigan.

Barley Brook, screened, 5/6; slack, 2/4.
Close Lane, average, 4/6.
Gidlom, average, 7/.
Hindley Fields, 5/.
Hindley Green, common, 4/8; best, 5/9.
Low Hall, round, 6/6 to 7/6; small, 3/ to 4/6.
Meadow House, round, 5/ to 7/3; slack, 2/6.
Platt Lane, 4/7 to 5/9.
Sherington, round, 7/; slack, 3/.
Strangeways Hall, coal, 6/3; slack, 3/.
Swan Lane, coals, 5/ and 6/; burgy, 4/6; slack, 3/.
Whitemoss, 4/6 to 6/8.

CHESHIRE.

Banks End, house, 7/; engine, 4/6.
Horse Leason, 5/ and 8/4.
Hough Hole, 6/4 to 8/4.
Lymer Clough, house, 8/4; steam, 5/5.
Poynton, coal, 7/10; slack, 4/2.
Robinsclough, 6/8
Roe Wood, 5/ and 8/.

SHROPSHIRE.

Benthall, 7/8.
Broseley, 8/.
Clee Hills, 5/ to 9/.
Comebury, coal, 10/; slack, 7/6.
Dark Lane, coal, 8/4 and 9/2.
Ifton, large, 8/4; mixed, 7/6; small, 6/8.
Madeley Wood, 10/ and 7/6.

GLOUCESTERSHIRE.

Forest of Dean.

Hopewell, 5/6 and 6/.
Miles Level, 3/6 to 8/.
Nelson, 5/6, 7/, and 8/.
Pillowell, 8/6.
Royal Forester, 6/ and 7/.

Bristol.

Bull Hall, 14/2, 11/8, 5/6, and 4/9.
Coal Pit Heath, 10/, 7/, and 4/.
Easton, 4/ to 14/.

SOMERSETSHIRE.

Radstock.

Clandown, 8/6.
Old Welton, 9/6 and 10/.
Welton Hill, 7/3.

Paulton.

Conygre, 10/.
Camerton, 10/, screened; 8/, unscreened; slack, 3/.
Farrington, 7/1.
Withy Mill, 8/.

Bedminster.

Ashton Vale, 4/, 8/, 10/, and 11/.

MONMOUTHSHIRE.

Aberbeeg, 5/5.
Arall, large, 6/6; slack, 3/.
Cwm Frwd, large, 6/.
Cwm, large, 6/6.
Golynos, 5/8.
Milfrain Hill, 6/6.

NORTH WALES.

FLINTSHIRE.

Broncoed, 5/6.
Coleshill, average, 10/.
Flint Marsh, 6/6.
Leeswood Main, main coal, 6/ to 7/6.
Nequis, coal, 6/; cannel, 10/.
Spon Green, coal, 7/6.
Queen's Ferry, coal, 7/; slack, 3/2.

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DENBIGHSHIRE.

Broughton Hall, 6/6.
Brymbo, 7/.
Bryn-y-Owen, 7/6.
Falwore, 7/2.
Frood, 6/2.
Westminster Brymbo, coal, 6/5; slack, 3/10.

ANGLESEA.

Port Marquis, 8/.

SOUTH WALES.

PEMBROKESHIRE.

Bonville Court, coal, 15/; culm, 5/; dust culm, 2/1.
Broadmoor, coal, 5/6.
Folkestone, coal, 6/8.
Moreton, average, 6/.
Shipping, anthracite, 12/6.
Southwood, coal, 10/; culm, 6/8.

CAERMARTHENSHIRE.

Bryn Gwyn, from 3/ to 10/.
Gwann cae Gerwain, 8/.
Gelly Ceidrim, coal, 5/10; slack, 2/6.
Gwendraeth, large, 7/6; through, 4/2; slack, 2/6.
Llangennech, prices at dock, 10/, 7/6, 5/6, 3/6.
New Lodge, 6/.
Ynysafen, large, 6/; through, 4/2.
Wain Cwm Gareing, 7/.

GLAMORGANSHIRE.

Alltwen, coal, 6/6.
Avon Vale, coal, 8/.
Blaenchydoch, 4/4.
Broad Oak, through and through, 5/ to 7/; small, 4/ to 5/; large, 8/ to 9/.
Bryndu, 7/8, 6/8, and 6/5.
Caedû, through and through, 5/.
Cethin, varies from 6/6 to 8/.
Craig-y-ralt, large, 8/; small, 5/.
Deep Dyffryn, large, 11/6; small, 4/6.
Gwain Clawdd, large, 7/; through and through, 4/; small, 3/.
Llancouch, large, 6/; small, 3/.
Mynydd Newydd, 4/5.
Onwllyn, through and through, 5/; large, 6/6.
Resolven, 7/6.
Tydran, 5/, 6/6, and 8/6.
Wenaut, common, 4/.
Werfa, 8/.
Wernddu, large, 6/.

SCOTLAND.

LANARKSHIRE.

Glasgow.

Balornock, dross, 2/6.
Jordan Hill, gas, 4/6; rough, 6/.
Kelvinside, gas, 9/; fire, 3/6.
Robroystone, 2/6.

Rutherglen

Eastfield, best, 6/8 to 7/6; seconds, 5/8 to 6/8.
Newton, 4/3.
Rosebank, 5/6.
Stonelaw, coal, 6/3; slack, 2/6.

Shettleston.

Greenfield, average, 6/.
Westmuir, coal, 6/5½; dross, 1/2½.

Ballieston.

Cardowan, 6/.
Craigend, 6/6.
Drumpark, 4/6 to 6/; slack, 1/9 to 2/.
Over Possil, 3/10 to 6/.
Provanhall, 5/3; slack, 1/6.

Coatbridge.

Coathill, 5/.
Dundyvan, 5/6.
Kirkwood, 5/6.
Phœnix, screened, 10/6; slack, 2/.
Rosehall, 5/.

Airdrie.

Clifton Hall, 5/.

AYRSHIRE.

Dalzielsie (Maybole), coal, 6/; small, 4/.
Duchray (Ayr), 5/.
Alnwick Lodge (Irvine), coal, 4/8; dross, 1/.
Boutrechill (Dreghorn), 5/2 to 5/10.
Burgh (Irvine), coal, 5/; tripping, 3/6; slack, 1/3.
Eglinton (Kilwinning), 4/4 to 5/10; dross, 2/.
Perceton (Irvine), coal, 4/8; dross, 1/.
Swineridge Muir (Stevenson), coal, 4/8; dross, 1/.
Bankhead (Kilmarnock), average, 4/3.
Busbie (Kilmarnock), 4/2 to 5/6.
Ganchland (Galston), average, 5/, landsale.
Portland (Kilmarnock), round, 4/3; slack, 1/6.
Common (Auchinlack), coal, 4/6 to 5/; dross, 1/6
Glenlogan (Cumnock), 3/2 to 4/9.
Pathhead (New Cumnock), 4/ to 6/.

STIRLINGSHIRE.

Alva, coal, 6/8; slack, 3/6.
Auchinbowie, average, 6.
Balmalloch, 6/.
Campsu, 4/2.
Plean, 6/.

DUMBARTONSHIRE.

Balgaffray, 3/, 4/6, and 5/6.
Blairdardie, coal, 5/6; slack, 2/; house, 7/6 and 8/9; steam, 4/7; dross, 2/6 to 3/6.
Braes o' Yetts, 5/6.
Meiklehill, screened, 6/8; tripping, 5/10.
Strone, 7/.

RENFREWSHIRE.

Benhar, 7/.
Linwood, 6/; slack, 3/.
Nitshill, average, 4/9.

ARGYLESHIRE.

Drumlemble, 6/8.

DUMFRIESSHIRE.

Canonbie, average, large and slack, 5/.
Bankhead, 5/4.
Gateside, 6/.

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Appendix, Foreign (1.)

Concessions of Coal and Iron Mines in FRANCE.

No.	Coal Basins.	1847 & 1852.	1853 & 1859.	1860 & 1865.	Increase. 1852 to 1865.	Iron Mines 1865.
1	Loire	70	72	72	2	6
2	Gard	45	48	52	7	18
3	Aveyron	33	39	43	10	7
4	Isère	26	29	37	11	45
5	Hérault	24	25	25	1	5
6	Alpes-Basses	22	22	23	1	..
7	Saône-et-Loire	22	22	23	1	3
8	Nord	20	20	21	1	5
9	Bouches-du-Rhone	19	20	20	1	..
10	Alpes-Hautes	17	19	31	14	..
11	Allier	15	18	20	5	1
12	Mayenne	10	10	11	1	..
13	Var	10	8	11	1	..
14	Maine-et-Loire	9	9	9	..	..
15	Loire-Haute	9	9	9	..	..
16	Saône-Haute	8	8	9	1	11
17	Pas-de-Calais	8	14	20	12	..
18	Puy-de-Dôme	8	8	11	3	1
19	Ardèche	7	7	8	1	10
20	Sarthe	6	6	7	1	..
21	Vaucluse	5	5	4	..	1
22	Aude	5	5	5	..	8
23	Creuse	5	5	5	..	1
24	Cantal	5	5	5	..	..
25	Vendée	5	5	5	..	..
26	Vosges	4	4	4	..	2
27	Ain	4	4	4	..	7
28	Loire-Inférieur	3	3	3	..	..
29	Corrèze	3	4	4	1	1
30	Tarn	2	2	2	..	..
31	Rhin Bas	2	5	5	3	3
32	Rhône	2	4	7	5	..
33	Drôme	2	3	3	1	1
34	Finistere	2	2	2	..	..
35	Calvados	1	1	1	..	..
36	Nièvre	1	1	1	..	..
37	Manche	1	1	1	..	1
38	Moselle	1	7	11	10	19
39	Yonne	1	1	1	..	..
40	Dordogne	1	2	2	1	..
41	Jura	1	2	2	1	6
42	Sèvres-Deux	1	1	1	..	..
43	Doubs	1	1	1	..	10
44	Landes	1	2	2	1	..
45	Pyrénées (Hautes)	..	1	1	1	..
46	Pyrénées-Orientales	1	1	1	..	23
47	Savoie	..	..	36	36	13
48	Savoie (Haute)	..	..	11	11	3
49	Lot	..	..	1	1	..
50	Alpes-Maritimes	..	..	1	1	1
51	Pyrénées (Basses)	..	..	1	1	8
	Meurthe	..	..	..	..	13
	Ariège	..	..	..	..	3
	Côte d'Or	..	..	..	..	3
	Rhin (Haut)	..	..	..	..	2
	Vienne (Haute)	..	..	..	..	1
	Corse	..	..	..	..	1
	Var	..	..	..	..	1
	Marne (Haute)	..	..	..	..	1
		448	490	595	148	245

Appendix, Foreign (2.)

COAL imported into FRANCE.

Date.	From Belgium.	From Great Britain.	From the Rhenish Provinces.	From other Parts.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
1847	1,656,865	576,046	267,466	2,828	2,503,205
1848	1,374,891	505,725	223,084	2,297	2,105,587
1849	1,563,968	561,923	224,685	1,723	945,199
1850	1,918,511	591,653	273,338	373	2,783,664
1851	1,994,275	591,475	292,975	355	2,878,880
1852	2,061,337	640,740	318,469	127	3,040,673
1853	2,267,923	654,514	424,870	176	3,447,483
1854	2,715,510	696,172	644,236	510	4,056,128
1855	3,156,775	865,660	839,784	1,670	4,863,789
1856	3,000,530	1,088,159	987,400	2,926	4,979,015
1857	2,967,792	1,218,757	1,080,219	5,179	5,271,947
1858	3,168,177	1,290,121	1,106,226	3,355	5,570,559
1859	3,286,055	1,270,946	997,405	2,133	5,656,539
1860	3,555,533	1,340,919	1,150,884	3,123	6,050,459
1861	3,508,026	1,413,333	1,250,116	2,494	6,177,961
1862	3,619,697	1,379,333	1,106,069	953	6,106,540
1863	3,648,945	1,273,446	1,087,389	1,375	6,011,155
1864	3,945,916	1,302,694	1,264,666	1,335	6,514,601

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Appendix, Foreign (3.)

COAL Exported from FRANCE.

Years.	To Algiers.	To Switzerland.	To Belgium.	To Sardinia.	To Spain.	To Germany.	To England.	To Tuscany.	To French Colonies.	To Sweden.	To Turkey and Egypt.	To Roman States.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1847	14,494	14,305	10,211	7,249	3,490	714	..	688	416	..	..	..
1848	14,838	10,304	8,097	6,751	482	436	..	538	1,116	1,304	1,558	..
1849	8,790	9,939	8,308	7,140	1,355	..	..	255	441	..	..	..
1850	5,784	15,360	6,658	9,831	166	..	..	422	157	..	..	..
1851	952	12,384	9,536	8,299	608	..	..	441	216	..	..	..
1852	6,069	13,808	7,464	9,202	1,424	..	..	88	874	..	..	..
1853	2,062	12,826	12,669	..	2,445	..	..	..	2,052	..	..	..
1854	4,812	19,426	50,786	..	4,999	..	2,180	412	157	..	864	..
1855	3,231	17,148	65,066	..	2,416	..	2,553	58	..	..	1,198	..
1856	1,375	20,900	49,342	..	1,640	..	471	..	..	..	..	..
1857	2,219	17,992	62,935	..	1,767	..	461	..	..	..	255	..
1858	3,221	40,680	53,860	..	5,421	..	..	1,424	..	..	..	..
1859	6,876	53,438	58,917	..	10,026	..	1,410	..	1,472	..	4,428	6,274
1860	7,788	55,137	99,266	..	7,729	..	4,900	..	..	..	8,819	7,692
1861	16,608	97,762	52,908	..	7,700	..	..	..	..	..	16,450	8,790
1862	17,089	66,756	54,567	..	7,758	..	825	..	..	..	23,266	9,831
1863	18,454	83,668	58,054	..	9,821	..	5,323	..	..	..	28,050	8,269
1864	25,899	89,041	53,065	..	10,332	..	1,129	..	..	..	36,820	8,181
1865												
1866												

Years.	To the Two Sicilies.	To the United States.	To British India.	To Austria.	To Mexico.	To India, China, and Cochin China.	To Russia.	To Other Parts.	To Italy.	To Sardinian States.	To German Association.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1847	..	..	..	..	..	..	..	526	..	..	..	52,093
1848	..	..	..	..	..	..	..	817	..	..	..	46,241
1849	..	..	..	..	..	..	..	785	..	..	..	37,013
1850	..	..	..	..	..	..	..	2,435	..	..	..	40,813
1851	..	..	..	..	..	..	..	1,718	..	..	..	34,154
1852	..	..	..	..	..	..	..	1,689	..	..	..	40,618
1853	196	..	..	..	..	..	..	3,437	..	9,595	..	45,282
1854	265	..	481	..	..	..	..	4,154	..	9,683	196	98,415
1855	166	..	127	..	..	..	..	3,054	..	14,290	275	109,582
1856	1,640	..	..	..	..	..	..	4,095	..	18,258	..	97,721
1857	569	..	..	2,008	..	..	..	2,789	..	26,950	..	117,940
1858	2,013	..	..	1,335	..	..	..	5,553	..	15,517	..	129,029
1859	6,080	147	106	..	..	..	..	6,980	..	18,215	736	175,105
1860	..	137	..	4,046	..	8,299	117	27,146	24,524	..	..	196,267
1861	..	..	..	1,934	..	..	3,987	40,906	24,376	..	..	277,951
1862	..	..	..	..	3,958	5,048	..	25,653	40,100	..	..	255,705
1863	..	..	..	..	9,674	4,881	..	28,059	54,793	..	..	309,713
1864	..	..	..	..	7,483	4,056	..	33,255	66,913	..	..	336,733
1865												
1866												

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The PRODUCTION of COAL in FRANCE since 1847, distinguishing the principal Coal Areas.

NAMES OF THE COAL BASINS.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Bassin de la Loire - -	1,681,762	1,299,404	1,345,447	1,522,488	1,477,300	1,602,002	1,881,628	1,186,916	2,242,235	2,380,327	2,202,609	1,922,131	2,001,879	2,315,565	2,488,864	2,764,624	2,763,143	2,988,713
„ de Valenciennes -	1,223,407	910,750	945,155	983,792	1,012,108	1,058,602	1,353,176	2,478,113	1,702,981	1,794,725	1,924,431	2,034,684	1,989,735	2,180,531	2,398,161	2,694,329	2,902,032	3,065,992
„ d'Alais - -	449,408	356,853	256,476	302,087	313,706	378,282	534,890	617,531	736,532	743,447	740,987	751,169	840,556	853,884	1,035,829	1,045,408	1,165,052	1,147,498
„ du Breusot et Blanzy	280,478	279,557	278,476	342,934	350,880	398,484	483,086	539,875	580,573	580,721	570,253	486,151	456,201	521,471	563,645	588,916	604,224	668,799
„ d'Aubin - -	207,963	124,378	105,983	114,724	141,025	167,975	233,111	302,827	336,522	461,639	450,777	286,622	317,124	390,946	494,396	547,108	561,926	492,063
„ de Commentry -	191,225	157,260	155,738	184,171	187,196	216,979	256,653	361,360	440,718	474,157	475,909	405,344	405,344	528,918	632,023	728,777	704,811	764,025
„ d'Epinac - -	108,906	76,116	75,880	65,086	68,563	99,206	134,347	130,550	132,117	155,325	159,132	150,088	156,983	153,136	166,655	168,956	149,942	151,230
„ du Maine -	102,616	89,325	97,241	87,032	88,383	102,506	77,343	93,562	89,989	98,852	89,853	106,600	80,054	84,260	94,726	108,570	103,986	98,697
„ d'Aix - -	96,810	87,803	106,684	102,565	100,041	103,743	121,982	119,390	130,830	142,116	157,810	130,267	126,762	157,309	148,778	151,657	187,409	193,776
* Plus 53 autres bassins dont le produit pour chacun insolément pendant aucune des six années ci-dessus n'a atteint 1,000,000 de quintalix métriques -	622,534	646,429	610,264	649,962	665,739	688,527	..	..	..	..	..	..	..	..	..	..	..	..
Bassin de Carmaux -	..	..	..	..	..	..	69,741	94,665	112,347	119,179	131,150	105,140	111,982	119,745	130,529	149,464	138,508	110,572
„ de Brassac -	..	..	..	..	..	..	60,657	66,445	85,249	89,207	122,910	123,780	96,276	131,057	149,398	150,915	158,971	170,490
„ de Ronchamp -	..	..	..	..	..	..	..	..	..	..	..	..	..	67,231	151,198	161,617	166,317	201,812
„ de St. Gervais, Graissesac - -	..	..	..	..	..	..	..	..	..	..	..	..	..	68,118	101,197	122,156	146,908	146,047
„ de la Sarre -	..	..	..	..	..	..	..	..	..	..	..	..	..	49,798	62,277	91,820	122,977	138,188
„ de la Basse Loire -	..	..	..	..	..	..	..	..	..	..	..	..	..	79,277	87,904	92,500	101,522	104,349
„ de Duize - -	..	..	..	..	..	..	..	..	..	..	..	..	..	89,092	93,413	94,046	88,459	100,351
* See note above; during the years '53 to '59 there were 60 - -	..	..	..	..	..	..	625,325	718,361	727,133	744,470	730,166	719,291	754,430	..	..	..	..	..
* During the years from '60 to '64 there were 55 -	..	..	..	..	..	..	..	..	..	..	..	..	..	415,056	456,052	440,453	457,219	504,192
Total -	5,065,109	4,017,875	3,977,344	4,354,840	4,404,941	4,816,306	5,831,939	6,709,535	7,917,226	7,784,165	7,755,987	7,221,267	7,337,326	8,155,394	9,125,040	10,102,116	10,518,406	11,046,794

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APPENDIX, Foreign (5.)

PRODUCTION of COAL in FRANCE from 1847 to 1864, both inclusive, distinguishing each Coal producing district.

NAME OF COAL DISTRICT.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ain	281	...	281	499	412	449	849	3,042	2,601	3,156	2,544	3,617	2,142	2,407	2,304	1,475	1,490	1,458
Aisne	687	333	726	161	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Allier	224,599	188,298	182,442	212,943	218,447	251,888	300,241	391,143	476,912	518,324	532,263	451,623	479,490	579,020	695,312	786,449	767,166	825,646
Alpes (Basses)	4,252	3,390	3,750	3,080	3,227	3,126	5,617	6,317	7,673	7,655	6,292	6,226	3,643	8,046	7,142	8,085	9,637	8,259
Alpes (Hautes)	5,009	4,474	4,954	397	4,661	4,635	4,700	4,483	5,465	5,500	6,398	6,011	5,660	6,871	6,945	6,837	6,736	6,905
Ardèche	9,782	10,172	9,055	12,232	12,431	15,084	16,978	19,753	28,631	31,604	28,373	33,491	30,975	16,097	11,477	7,594	7,713	9,504
Aude	229	1,979	2,921	1,873	1,515	1,984	2,150	2,545	2,467	3,082	3,296	2,033	1,944	1,119	106	982	1,050	789
Aveyron	224,982	132,770	114,727	123,293	150,971	179,114	245,178	315,829	349,758	477,292	468,156	296,353	331,885	408,530	505,213	561,754	576,568	507,662
Bouches-du-Rhône	90,444	87,411	105,880	102,235	99,750	103,616	120,706	119,330	130,890	142,116	147,498	119,464	123,796	156,682	147,481	153,528	185,493	186,901
Calvados	40,704	28,738	28,698	27,666	26,905	24,461	26,261	32,992	36,723	37,665	27,139	23,690	21,245	17,997	17,883	16,449	15,917	14,320
Cantal	32	245	645	567	680	569	848	638	694	842	1,889	1,932	1,574	1,271	1,135	1,185	1,178	1,351
Corrèze	1,702	2,645	4,684	4,865	5,685	5,802	4,781	6,451	5,962	6,022	5,747	5,441	5,606	7,509	8,488	8,142	6,057	5,808
Creuse	4,384	3,574	3,899	3,491	3,620	4,243	5,300	6,607	7,782	9,600	13,339	17,042	16,212	13,301	8,565	10,004	12,855	24,993
Doubs	72	324	294	46	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dordogne	..	..	..	..	..	..	..	294	285	1,473	1,720	737	1,232	1,167	1,125	847	1,282	1,191
Drôme	..	..	..	..	..	..	..	..	550	410	424	612	697	485	671	753	1,615	1,856
Gard	458,994	351,909	260,694	303,756	317,487	379,114	586,752	620,960	737,108	736,678	735,286	745,741	836,028	863,571	1,052,103	1,058,927	1,178,924	1,159,434
Hérault	37,249	45,035	47,072	42,059	43,081	49,463	46,902	54,483	61,858	58,008	56,682	56,182	86,043	72,380	106,471	127,353	150,837	150,084
Isère	62,625	63,520	62,466	67,654	77,585	81,897	80,771	81,775	75,894	79,002	81,350	72,744	76,878	69,462	75,602	70,158	81,195	93,105
Loire	1,691,825	1,302,996	1,349,802	1,580,301	1,484,210	1,609,912	1,890,737	2,176,454	2,248,852	2,376,947	2,198,648	1,917,024	1,993,776	2,317,061	2,488,376	2,766,182	2,771,539	2,994,283
Loire (Haute)	36,304	23,875	33,326	40,135	36,429	42,951	44,641	47,312	69,930	70,419	86,636	86,572	68,440	94,359	108,722	111,285	113,823	124,327
Loire, Inférieure	17,589	10,564	4,988	7,922	16,501	14,823	8,319	20,415	25,291	33,048	32,549	32,753	30,053	27,084	30,706	29,331	27,629	24,257
Lot	..	..	..	..	..	..	1,591	2,651	2,582	2,298	1,718	1,669	1,767	1,181	628	793	815	1,088
Maine-et-Loire	40,626	52,643	4,110	36,076	41,014	43,093	44,250	40,078	47,661	47,520	54,529	54,260	48,294	52,192	57,197	63,169	73,892	80,092
Mayenne	71,702	58,177	70,988	61,927	74,243	83,904	70,711	86,571	79,179	86,714	75,059	87,265	70,929	70,900	89,261	100,148	97,165	86,961
Moselle	147	..	..	..	..	..	..	..	..	691	6,263	25,538	41,085	49,798	62,277	62,356	122,977	138,188
Mauche	..	..	..	..	..	..	..	..	..	..	..	519	346	..	..	..	..	..
Nièvre	6,591	49,407	47,187	56,959	57,685	72,614	84,846	92,041	89,048	89,687	86,887	82,614	79,374	89,092	93,413	94,046	88,459	100,351
Nord	1,223,228	910,752	945,150	983,299	1,012,104	1,053,687	1,304,157	1,403,684	1,572,951	1,549,562	1,540,103	1,586,803	1,508,339	1,566,561	1,621,079	1,705,389	1,779,259	1,812,588
Pas-de-Calais	19,263	17,359	17,084	19,097	23,167	36,407	65,416	111,006	142,681	263,366	400,984	454,925	496,450	579,599	797,711	1,007,253	1,142,890	1,272,011
Puy-de-Dôme	26,581	15,401	14,828	17,019	51,442	29,235	41,653	84,267	73,269	69,725	84,212	76,288	56,033	67,085	71,104	70,408	76,859	87,256
Pyrénées (Hautes)	..	..	..	..	..	..	..	..	..	..	..	..	1,605	694	..	..	..	..
Pyrénées (Basses)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	108	157	157	53
Pyrénées (Orientales)	..	..	327	785	176	196	..	..	..	..	..	..	..	..	..	..	..	..
Rhin (Haute)	336	..	..	..	..	..	..	..	..	..	..	..	..	..	..	209	209	206
Rhin (Bas)	8,114	6,417	9,279	8,654	8,026	10,028	19,511	18,664	20,421	16,588	14,422	12,490	12,355	12,125	12,254	12,859	9,749	9,982
Rhône	19,581	16,523	17,056	20,560	12,180	17,417	20,099	28,204	25,522	32,670	28,766	30,650	24,956	26,863	30,374	32,272	29,341	30,412
Saône (Haute)	31,758	31,474	68,232	75,662	64,856	55,949	72,447	71,985	68,910	68,398	57,203	74,341	75,110	76,912	161,159	170,746	175,924	212,118
Saône-et-Loire	516,484	374,782	379,950	482,311	440,036	518,629	635,693	691,580	730,150	759,734	748,522	654,462	625,392	691,114	752,267	777,366	769,665	847,333
Sarthe	42,105	39,383	39,826	30,342	25,481	27,537	19,868	25,493	28,853	30,189	31,477	34,910	24,927	24,022	19,099	22,022	23,095	26,033
Savoie	..	..	..	..	..	..	..	..	..	..	..	..	..	4,003	5,492	7,374	7,189	7,884
Savoie (Haute)	..	..	..	..	..	..	..	..	..	..	..	..	..	6,009	7,790	6,099	6,604	6,357
Sèvres (Deux)	9,537	9,173	8,250	10,553	12,686	12,706	12,053	14,260	17,182	18,780	16,977	13,891	15,286	17,165	22,279	23,235	22,098	20,919
Tarn	41,981	33,777	47,227	54,459	51,978	61,081	69,743	94,910	112,424	119,228	131,150	105,140	111,982	119,745	130,529	149,464	133,508	110,572
Vaucluse	10,609	9,488	8,528	9,241	7,770	7,022	8,995	10,377	9,242	5,794	6,207	5,048	4,630	4,028	3,941	3,894	4,767	4,453
Vendée	13,316	8,330	7,107	14,181	16,940	12,072	15,303	16,138	15,897	20,258	28,679	25,709	25,725	23,147	24,591	27,731	37,808	31,143
Vosges	1,354	782	782	1,138	833	1,223	1,947	1,366	2,705	2,535	2,270	1,984	2,545	2,105	2,592	2,644	2,165	2,835
Var	3,037	4,000	3,026	3,221	2,062	460	1,625	982	1,580	1,571	13,278	13,455	4,487	6,077	9,251	10,155	8,510	8,932

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Appendix, Foreign (6.)

Price Current of Coal and Coke, at the following Coalfields, 15th December 1869.

[Bulletin de la Société de l'Industrie Minérale, Paris, 1869.]

A Saint-Etienne.	100 Kilos.* f.	f.
Pérats dur de première qualité	2.20	à 2.40
Grèle	2.20	2.35
Pérats tendres, bonne qualité	2.10	2.20
„ qualité ordinaire	1.90	2.00
Menu pour gaz, première qualité	1.40	1.50
„ deuxième „ „	1.10	1.20
„ de forge, première qualité	1.50	1.70
„ „ deuxième „	1.20	1.30
„ de chauffage, premiere, qualite	1.30	1.40
„ „ deuxième	1.05	1.15
„ „ pour la grosse forge	1.00	1.10
„ pour fours à chaux	0.60	0.80
Grelassons, premier choix	1.80	1.90
„ deuxième „	1.45	1.60
Debris de crible, bonne qualité	1.50	1.70
„ seconde qualité	1.20	1.40
Petites chatilles lavées	1.30	1.40
„ non lavées	0.95	1.20
Coke lavé première choix	2.80	3.00
„ deuxième „	2.40	2.60
Coke lavé et non lavé, pour hauts fourneaux	2.00	2.20
Petit coke, bonne qualité, pour chauffage	1.60	1.80
„ escarbilles	0.50	0.70
Houillères de Rive-de-Gier.		
Malbroug	1.40	1.80
Menu	1.20	1.50
Pérats et grèles	2.20	2.50
Coke lavé	2.80	3.00
Coke non lavé	2.25	2.35

Bassin houiller de la Moselle.

Prix de vente des houilles sur le carreau de la mine, chargement compris sur voiture ou sur wagons.
1st December 1869.

	f.
Gros	1.70
Tout venant	1.20
Menu	0.50

Direction Royale des mines de Sarrebruck.

Prix de vente des houilles du Bassin de la Sarre.

1. Debit par le canal de la Sarre.

Qualité et provenance des houilles. Prix franco dans les bateaux.

A.—Port de Sarrebruck.

	f.
Houille morceaux choisis	16.75
„ criblée	15.50
„ brocailles choisies	15. 0
Charbons gras 1re sorte :	
Heinitz-Dechen	14.75
Duttweiler, Sulzbach et Altenwald	14.25
Charbons gras 2e sorte (tout venant) :	
Heinitz Dechen	2.15
Duttweiler, Sulzbach et Altenwald	10.80
Charbons flambans 1re sorte :	
Reden	14.25
Von der Heydt	13.50
Charbons flambans 2e sorte (tout venant) :	
Von der Heydt et Friederichsthal	10.80
Itzenplitz et Ziehwald	10.50
Griesborn	10.00
Petites brocailles	10.50
Demi-tout-venant	9.25
Charbons flambans 3e sorte :	
Von der Heydt et Reden	7.50
Menu du magasin	7.00

B.—Au port de Louisenthal :

Louisenthal, morceau	16.75
„ 1re sorte	14.50
„ 2e „	11.00
„ 3e „	6.00

2. Débit par le chemin de fer.

Prix franco sur wagon.

a. Charbons flambans.

Louisenthal, Grosses houilles	16.75
„ 1re sorte	14.50
„ 2e „	11.00
„ 3e „	6.00
Von der Heydt, Grosses houilles	13.80
„ 1re sorte	12.50
„ petites brocailles	10.50
„ 2e sorte	9.75
„ 3e „	6.25
1re sorte	12.50
2e „	10.00
3 „	6.25
Friederichstal 2e sorte	9.50
Itzenplitz	9.25
Zeihwald	9.25
Griesborn	8.75

b. Charbons gras.

Dudweiler, 1re sorte	13.00
2e „	9.70
3e „	6 875
Sulzbach, 1re sorte	12.90
2e „	9.65
3e „	6.80
Altenwald, 1re sorte	12.80
„ 2e „	9.60
„ 3e „	6.70
Heinitz-Dechen, 1re sorte	12.50
„ 2e „	10.00
„ 3e „	6.50

* 100 Kilos. or 1 Metrical Quintal is equal to 1 cwt. 3·674 qrs.

Appendix Foreign (7.)

The Production of Coal in BELGIUM and its Exportation.

Year.	Production. Mons.	Centre.	Charleroy.	Hainault. Total.	Namur.	Liège.	Total Production of Belgium.	Exports. France.	Pays Bas.	Other Places by Land.	Other Places by Sea.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1815	—	—	—	—	—	—	—	198,462	—	—	—	—
1816	—	—	—	—	—	—	—	272,014	—	—	—	—
1817	—	—	—	—	—	—	—	192,742	—	—	—	—
1818	—	—	—	—	—	—	—	208,022	—	—	—	—
1819	—	—	—	—	—	—	—	170,945	—	—	—	—
1820	—	—	—	—	—	—	—	227,213	—	—	—	—
1821	—	—	—	—	—	—	—	251,801	—	—	—	—
1822	—	—	—	—	—	—	—	267,777	—	—	—	—
1823	—	—	—	—	—	—	—	264,873	—	—	—	—
1824	—	—	—	—	—	—	—	394,451	—	—	—	—
1825	—	—	—	—	—	—	—	439,248	—	—	—	—
1826	—	—	—	—	—	—	—	410,611	—	—	—	—
1827	—	—	—	—	—	—	—	423,234	—	—	—	—
1828	—	—	—	—	—	—	—	470,869	—	—	—	—
1829	—	—	—	—	—	—	—	435,947	—	—	—	—
1830	—	—	—	1,913,677	—	—	—	510,806	—	—	—	—
1831	—	—	—	1,765,010	—	455,536	—	468,937	89	—	497	469,513
1832	—	—	—	1,737,579	—	461,873	—	467,541	1,334	70	679	1,289,624
1833	—	—	—	1,945,150	—	508,405	—	577,103	449	100	2,139	579,791

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Year.	Production.						Total Production of Belgium.	Exports.				Total.
	Mons.	Centre.	Charleroy.	Hainault. Total.	Namur.	Liège.		France.	Pays Bas.	Other Places by Land.	Other Places by Sea.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1834	1,182,005	330,740	305,808	1,818,553	—	520,000	—	654,836	3,017	100	2,153	660,012
1835	1,239,845	329,620	395,701	1,965,166	—	591,931	—	685,086	5,173	3,461	1,916	695,586
1836	1,375,657	372,561	601,206	2,349,374	79,174	627,916	3,056,464	761,587	7,288	3,039	1,758	773,612
1837	1,473,948	356,641	639,015	2,469,604	92,473	666,729	3,228,806	780,429	6,685	1,726	243	789,083
1838	1,454,749	375,717	585,443	2,415,909	103,954	740,408	3,260,271	766,427	7,247	949	911	775,534
1839	1,521,136	422,949	654,926	2,599,011	134,397	755,753	3,479,161	727,362	17,551	456	200	745,569
1840	1,753,342	452,726	770,095	2,956,163	125,058	853,123	3,930,222	718,286	60,757	39	391	779,473
1841	1,599,416	518,419	851,040	2,968,875	123,038	935,853	4,027,765	916,128	95,650	82	3,334	1,015,194
1842	1,639,705	536,583	882,095	3,059,183	135,578	940,902	4,140,462	902,710	102,697	3,971	5,338	1,014,716
1843	1,442,951	543,946	887,576	2,874,453	141,456	966,365	3,982,274	923,890	154,553	4,763	3,115	1,086,321
1844	1,718,627	598,200	973,901	3,290,728	154,904	1,019,908	4,445,240	1,034,956	196,883	7,911	4,449	1,245,399
1845	1,908,613	614,484	1,147,926	3,671,023	162,625	1,036,045	4,919,156	1,310,646	225,040	2,900	4,886	1,543,472
1846	1,969,884	607,185	1,221,264	3,798,333	160,687	1,078,380	5,037,402	1,222,439	123,769	4,917	4,708	1,355,833
1847	2,098,068	666,385	1,437,078	4,201,531	159,014	1,303,905	5,664,456	1,535,465	231,402	63,967	6,271	1,837,105
1848	1,859,444	645,155	1,150,243	3,654,742	157,802	1,050,170	4,862,694	1,239,743	208,673	1,429	8,305	1,460,570
1849	1,962,037	740,480	1,315,678	4,018,195	170,195	1,063,453	5,251,843	1,453,155	202,935	559	8,294	1,664,973
1850	2,065,337	834,058	1,500,366	4,420,761	177,602	1,222,225	5,820,588	1,756,568	221,088	1,029	9,487	1,987,184
1851	2,143,854	930,447	1,678,885	4,753,186	188,232	1,292,099	6,233,517	1,817,221	230,753	634	8,433	2,057,050
1852	2,389,128	1,030,477	1,815,041	5,234,246	182,702	1,377,906	6,795,254	1,866,097	225,752	628	11,069	2,103,546
1853	2,475,577	965,468	2,041,706	5,482,771	186,611	1,503,275	7,172,657	2,112,152	205,185	1,231	13,027	2,331,595
1854	2,846,315	1,052,079	2,259,466	6,154,860	210,992	1,582,790	7,947,742	2,391,336	210,343	1,809	23,142	2,625,968
1855	3,000,523	1,094,878	2,363,015	6,458,415	230,681	1,720,053	8,409,330	2,806,340	155,845	2,367	7,806	2,974,349
1856	2,594,011	1,057,376	2,567,745	6,219,132	218,609	1,774,678	8,212,419	2,690,462	166,569	1,464	7,622	2,866,137
1857	2,691,079	1,083,169	2,666,934	6,441,182	201,804	1,740,916	8,383,902	2,680,079	190,541	6,524	9,868	2,887,012
1858	2,869,610	1,120,587	2,864,814	6,855,011	217,774	1,852,929	8,925,714	2,866,000	182,015	14,574	1,727	3,091,316
1859	3,007,124	1,098,670	2,993,532	7,199,326	220,850	1,840,526	9,260,702	2,988,252	148,055	7,802	1,126	3,145,235
1860	3,012,615	1,178,600	3,315,505	7,506,720	204,528	1,898,647	9,609,895	3,298,292	144,085	4,975	2,954	3,450,306
1861	3,247,960	1,233,005	3,454,680	7,935,645	243,061	1,878,457	10,057,163	3,217,694	146,567	8,600	6,548	3,379,409

Appendix, Foreign (8.)

Production of COAL and BROWN COAL in PRUSSIA.

Coal Pits. Government District.	Quantity produced (including consumption at the Pits) in Metrical Tonne of 20 Zollverein Centners.			Value at Pit's Mouth in Prussia Thalers of 3s.		
	1860.	1862.	1864.	1860.	1862.	1864.
A.—Coal.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1. Upper Silesia, Appeln	2,365,600	3,072,698	3,859,466	3,069,416	3,444,197	4,603,381
2. Waldenburg, Breslau, Liegnitz	741,900	892,282	1,063,931	1,533,350	1,679,909	1,970,294
3. Wellin and Löbgon, Merseburg	54,050	55,671	65,889	152,134	164,674	191,964
4. Minden, Minden	10,000	9,712	10,473	29,273	28,739	30,821
5. Ibbenbühren, Munster	79,800	103,845	98,255	240,241	275,350	242,170
6. Ruhr, Arcensburg, Dusseldorf	4,276,200	6,123,791	8,037,705	9,063,160	9,706,095	12,068,348
7. Aix-la-Chapelle	632,000	687,651	751,257	1,734,668	1,767,942	1,849,951
8. Saar, Treves	2,019,500	2,137,741	2,660,749	5,457,060	5,498,147	6,563,424
Total of (A) Coal	10,179,050	13,083,391	16,547,745	21,296,332	22,565,053	27,540,333
B.—Brown Coal.						
1. Appeln	2,670	2,562	1,307	1,265	1,833	810
2. Breslau	13,730	23,424	23,198	13,863	19,109	18,706
3. Liegnitz	103,930	138,961	189,180	89,931	112,792	175,629
4. Posen	2,840	5,300	4,968	2,241	3,835	4,333
5. Bromberg and Marienwerder	3,600	6,959	5,520	3,076	5,416	4,294
6. Frankfort	267,870	408,589	515,697	246,060	328,380	442,878
7. Potsdam	129,250	170,362	183,058	109,278	134,811	211,102
8. Stettin	—	8,220	8,210	—	1,123	8,536
9. Magdeburg	1,059,200	1,198,544	1,368,922	1,152,232	1,162,898	1,466,213
10. Merseburg	1,423,130	1,665,492	2,183,231	1,234,366	1,378,016	1,800,806
11. Minden	870	1,117	1,349	736	643	514
2. Cologne, Dusseldorf, Aix-la-Chapelle, and Coblentz	187,255	64,219	166,887	119,810	133,544	114,973
Total of (B) Brown Coal	3,194,640	3,815,129	4,649,527	2,971,858	3,332,400	4,251,786
Grand Total	13,373,690	16,903,520	21,197,272	24,270,190	25,897,453	31,792,119

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Appendix, Foreign (9.)

The Production of COAL and BROWN COAL in the AUSTRIAN STATES in Vienna Centners of 123½ lbs. Avoirdupois.

Year.	Lower Austria.	Upper Austria.	Styria.	Illyria.	Coast Land.*	Tyrol.	Bohemia.	Moravia and Silesia.	Galicia.	Dalmatia.	Lombardy.	Venetia.	Hungary.	Banat.	Total.
	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	V. C.	P. C.
1823	100,737		324,943	22,915		73,875	1,396,599	255,132	296	—	—		241,197		2,417,696
1824	43,261		450,724	37,803		57,195	1,507,300	300,598	190	—	—		309,961		2,697,051
1825	103,944		354,893	31,308		45,325	1,504,785	297,788	48	—	—		427,771		2,760,862
1826	117,374		341,179	50,854		45,110	1,668,643	315,670	136	—	612		543,966		3,083,541
1827	198,562		422,368	39,137		35,415	1,659,332	344,999	92	—	68		501,275		3,210,148
1828	189,904		388,379	51,782		25,985	1,658,451	366,093	—	—	4,107		399,380		3,084,681
1829	202,304	18,021	386,221	56,061		36,294	1,705,942	352,516	—	—	29,518	2,527	404,600		3,191,927
1830	243,405	6,200	397,791	72,334		38,406	2,112,259	407,207	—	—	—	1,625	481,999		3,761,255
1831	178,565	28,229	404,986	104,739		23,042	2,055,061	401,964	102	—	38,712	915	287,668		3,524,003
1832	214,045	12,950	397,520	88,692		45,266	2,215,977	447,449	250	—	21,669	2,370	382,339		3,818,527
1833	251,020	22,136	215,106	77,049		46,619	2,118,213	479,091	—	—	30,003	3,389	274,554		3,497,181
1834	358,865	30,121	239,869	45,927	39,670	46,541	2,563,962	592,592	—	—	36,528	1,661	286,305		4,239,841
1835	460,746	8,386	324,546	111,074	24,048	43,440	2,646,972	590,738	—	—	46,374	2,018	219,907		4,478,249
1836	448,198	1,250	390,446	113,725	30,910	17,052	2,740,172	740,851	—	—	49,856	2,179	353,493		4,888,133
1837	450,661	3,790	425,555	92,653	35,200	14,760	2,745,010	831,572	—	134,952	39,765	2,120	279,910		5,055,949
1838	550,783	4,063	454,402	131,083	45,901	32,157	3,453,776	920,009	—	126,370	39,706	11,450	252,634		5,962,355
1839	689,315	60,114	391,390	163,046	73,105	30,468	4,178,923	1,338,178	110	130,000	39,895	33,509	587,298		7,715,451
1840	740,903	187,295	459,542	221,732	79,392	12,644	4,299,921	1,659,803	1,006	142,680	33,523	41,614	573,870		8,453,925
1841	980,135	114,194	496,644	322,526	64,237	16,944	4,774,127	1,827,142	—	173,000	59,990	38,304	613,615		9,480,858
1842	1,037,010	125,050	531,870	322,069	80,594	52,136	4,685,348	1,956,213	—	77,825	68,146	57,892	362,786		9,356,889
1843	947,774	138,281	605,886	594,309	82,877	49,815	4,566,721	1,680,372	2,030	73,219	72,932	105,068	377,067		9,296,351
1844	1,241,366	168,377	614,484	687,897	80,572	56,551	5,703,831	2,295,544	3,342	78,829	73,452	93,300	407,584		11,505,029
1845	1,248,469	177,375	755,107	746,419	80,993	69,592	6,405,160	2,712,655	—	109,450	106,477	107,272	368,661		12,887,630
1846	1,269,009	201,027	718,966	849,076	82,111	58,782	7,209,550	3,182,051	2,958	134,141	179,650	120,650	260,340		14,268,811
1847	1,382,250	256,850	871,444	851,674	75,881	55,891	7,476,653	3,121,196	35,588	105,561	218,188	?	447,686		14,893,362
1848	No Returns obtainable for these Years.														
1849															
1850	1,252,527	355,557	1,214,008	595,786	97,480	62,594	8,439,391	4,573,089	955,993	188,712	130,000	96,947	1,180,000	343,912	20,105,973
1851	1,420,772	776,950	1,581,714	703,712	89,942	90,252	10,347,544	5,017,372	1,050,494	143,650	177,160	127,294	2,266,086	587,877	24,380,769
1852	1,673,178	985,569	2,059,345	944,222	123,120	120,002	12,838,772	6,089,450	966,117	145,000	188,642	170,823	3,101,200	732,106	30,032,546
1853	1,607,074	963,657	2,312,984	1,169,817	144,890	129,065	13,309,390	5,509,528	1,016,028	145,000	272,403	221,496	3,518,313	851,556	31,254,151
1854	1,609,893	495,821	2,958,225	1,393,846	197,162	155,790	13,995,416	6,550,860	1,265,887	143,000	300,000	270,000	3,714,710	1,127,926	33,178,536
1855	1,471,628	463,375	3,941,969	1,442,370	198,584	129,429	16,637,445	6,679,120	1,138,812	?	?	?	3,043,063	1,557,008	37,518,769
1856	1,581,968	413,869	4,559,836	1,350,530	204,520	136,327	19,755,968	7,960,703	1,311,208	?	?	?	3,011,307	1,467,246	41,753,492
1857	1,637,547	546,565	5,142,911	1,427,876	215,045	143,484	20,630,289	9,493,009	1,307,667	?	?	?	3,131,389	1,204,974	44,880,756
1858	1,687,043	692,350	6,178,847	1,415,704	207,229	122,742	23,739,097	10,420,358	1,720,314	83,383	96,706	91,732	3,183,687	1,054,522	51,975,774
1859	1,833,630	716,556	5,818,439	1,257,730	204,993	88,639	26,098,054	10,915,456	1,664,239	86,083	—	118,629	5,822,899	1,301,108	55,926,505
1860	2,100,795	1,294,253	6,453,268	1,466,662	213,340	81,285	28,100,029	12,256,528	1,864,474	117,408	—	132,140	6,941,386	1,648,011	62,569,579
1861	2,271,124	1,669,214	7,640,204	1,910,447	243,250	89,806	34,395,316	13,373,004	1,909,401	129,165	—	124,856	8,537,280	300,175	72,593,242
1862	2,381,226	2,312,164	8,887,665	2,167,441	237,892	86,974	37,407,295	14,714,690	2,174,690	141,959	—	290,119	10,112,970	409,047	81,294,582

* Küstenland ("coast land"), or the maritime district of Austria, comprises the circles of Göritz and Istria, and the territory but not the town of Trieste.—(*Keith Johnson*).

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APPENDIX, Foreign (10.)

ANTHRACITE COAL TRADE OF PENNSYLVANIA.

The following Table exhibits the Anthracite Coal sent to market from the different regions in Pennsylvania, from the commencement of the trade in 1820 to 1865 inclusive.

Year.	SCHUYLKILL.					Sold on the Line of Schuylkill.	LEHIGH.			WYOMING REGION.							Shamokin.	Aggregate.	Annual Increase.
	Canal.	Railroad.	Total.	Pinegrove.	Little Schuylkill.		Canal.	Railroad.	Total.	By Lehigh Railroad.	Delaware and Hudson Coal Company.	Pennsylvania Coal Company.	By Canal.	Del., Lack., and Western Railroad.	L. and B. R. R.	Total.			
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1820	—	—	—	—	—	—	365	—	365	—	—	—	—	—	—	—	—	365	—
1821	—	—	—	—	—	—	1,073	—	1,073	—	—	—	—	—	—	—	—	1,073	708
1822	1,480	—	1,480	—	—	—	2,240	—	2,240	—	—	—	—	—	—	—	—	3,720	2,647
1823	1,128	—	1,128	—	—	—	5,823	—	5,823	—	—	—	—	—	—	—	—	6,951	3,231
1824	1,567	—	1,567	—	—	—	9,541	—	9,541	—	—	—	—	—	—	—	—	11,108	4,157
1825	6,500	—	6,500	—	—	—	28,393	—	28,393	—	—	—	—	—	—	—	—	34,893	23,785
1826	16,767	—	16,767	—	—	—	31,280	—	31,280	—	—	—	—	—	—	—	—	48,047	13,154
1827	31,360	—	31,360	—	—	—	32,074	—	32,074	—	—	—	—	—	—	—	—	63,434	15,387
1828	47,284	—	47,284	—	—	3,154	30,232	—	30,232	—	—	—	—	—	—	—	—	77,516	14,082
1829	79,973	—	79,973	—	—	3,333	25,110	—	25,110	—	7,000	—	—	—	—	7,000	—	112,083	34,567
Total	186,059	—	186,059	—	—	7,486	166,131	—	166,131	—	7,000	—	—	—	—	7,000	—	359,190	—
1830	89,984	—	89,984	—	—	5,321	41,750	—	41,750	—	43,000	—	—	—	—	43,000	—	174,734	62,651
1831	81,854	—	81,854	—	—	6,150	40,966	—	40,966	—	54,000	—	—	—	—	54,000	—	176,820	2,086
1832	209,271	—	209,271	—	14,000	10,048	70,000	—	70,000	—	84,600	—	—	—	—	84,600	—	363,871	187,051
1833	252,971	—	252,971	—	40,000	13,429	123,000	—	123,000	—	111,777	—	—	—	—	111,717	—	497,748	123,877
1834	226,692	—	226,692	—	34,000	19,429	106,244	—	106,244	—	43,700	—	—	—	—	43,700	—	376,636	d. 111,112
1835	339,508	—	339,808	—	41,000	18,571	131,250	—	131,250	—	90,000	—	—	—	—	90,000	—	560,758	184,122
1836	432,054	—	432,045	—	35,000	17,963	148,211	—	148,211	—	103,861	—	—	—	—	103,861	—	684,117	123,359
1837	523,152	—	523,152	17,000	31,000	21,749	223,902	—	223,902	—	115,387	—	—	—	—	115,387	—	879,444	195,327
1838	453,875	—	453,875	13,000	13,000	28,775	213,615	—	213,615	—	78,207	—	—	—	—	78,207	—	738,697	140,747
1839	442,608	—	442,608	20,539	9,000	30,390	221,025	—	221,025	—	122,300	—	—	—	—	122,300	—	818,402	79,805
Total	3,031,960	—	3,031,960	50,539	217,000	171,725	1,319,963	—	1,319,963	—	846,832	—	—	—	—	846,832	—	5,261,197	—

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1840	452,291	—	452,291	23,860	20,000	28,924	225,318	—	225,318	—	146,470	—	—	—	—	146,470	15,505	864,384	45,962
1841	584,692	850	585,542	17,653	40,000	41,223	143,037	—	143,037	—	192,270	—	—	—	—	192,270	21,466	959,978	95,589
1842	491,602	49,902	541,504	32,381	37,000	40,584	272,546	—	272,546	—	205,253	—	47,346	—	—	252,599	10,000	1,108,418	146,445
1843	447,058	230,254	677,312	22,905	31,000	34,619	267,793	—	267,793	—	227,605	—	58,000	—	—	285,605	10,000	1,263,598	155,180
1844	398,887	441,491	840,378	34,916	57,000	60,000	377,002	—	377,002	—	251,005	—	114,906	—	—	365,911	13,087	1,630,850	367,252
1845	263,587	820,237	1,083,796	47,928	74,000	90,000	429,453	—	429,453	—	273,435	—	178,401	—	—	451,836	10,000	2,013,013	383,163
1846	3,440	1,233,142	1,236,582	58,926	91,000	155,460	517,116	—	517,116	5,896	320,009	—	192,503	—	—	518,389	12,572	2,344,005	330,992
1847	222,693	1,360,681	1,583,374	67,457	106,401	226,610	633,507	—	633,507	10,466	388,203	—	284,398	—	—	583,067	14,904	2,882,369	538,304
1848	436,602	1,216,233	1,652,835	61,530	162,626	252,837	670,321	—	670,321	10,425	437,500	—	237,271	—	—	685,196	19,356	3,089,238	206,229
1849	469,206	1,115,918	1,605,126	78,299	174,758	239,290	781,656	—	781,656	19,590	454,240	—	259,080	—	—	732,910	19,650	3,217,641	128,403
Total -	3,790,360	6,468,708	10,358,740	445,855	793,788	1,169,547	4,517,749	—	4,317,749	46,367	2,867,981	—	1,371,905	—	—	4,216,253	146,537	19,373,429	—
1850	288,030	1,423,977	1,712,007	70,919	211,960	207,863	690,456	—	690,456	38,156	441,403	111,014	243,350	—	—	827,822	19,921	3,321,136	103,495
1851	579,156	1,650,270	2,229,426	—	310,307	312,367	964,224	—	964,224	23,072	479,078	316,017	336,000	—	—	1,156,167	24,899	4,322,530	1,006,334
1852	800,038	1,650,912	2,450,950	66,543	325,099	322,211	1,072,136	—	1,072,136	41,890	497,105	426,164	319,341	—	—	1,284,500	25,846	4,899,975	570,445
1853	888,695	1,582,248	2,470,943	80,660	389,295	394,078	1,054,309	—	1,054,309	26,235	494,327	512,639	442,511	—	—	1,475,732	15,500	5,097,144	197,169
1854	907,354	1,987,854	2,895,208	91,462	444,184	444,160	1,207,186	—	1,207,186	39,232	440,944	496,648	492,689	133,965	—	1,603,478	63,500	5,831,834	734,690
1855	1,105,263	2,213,292	3,318,555	112,213	426,208	471,861	1,275,050	9,063	1,284,113	50,209	565,460	504,803	464,039	187,000	—	1,771,511	116,117	6,486,097	654,263
1856	1,169,453	2,088,903	3,258,356	157,152	454,515	520,499	1,186,230	165,740	1,351,970	44,270	499,650	612,500	510,631	305,530	—	1,792,581	137,406	6,751,542	266,445
1857	1,275,989	1,709,552	2,985,541	145,012	346,877	511,977	900,314	418,235	1,318,541	37,959	480,699	536,008	407,914	490,023	—	1,952,603	155,806	6,431,378	d. 320,164
1858	1,323,804	1,542,645	2,866,449	137,376	383,931	441,166	909,000	471,030	1,380,030	69,644	348,789	630,056	346,450	683,411	210,042	2,186,094	135,893	6,524,838	93,460
1859	1,372,021	1,632,932	3,004,953	125,262	366,343	554,774	1,050,659	577,652	1,628,311	71,399	591,000	688,854	453,548	829,435	223,806	2,731,236	180,753	7,517,516	1,092,678
Total -	9,709,803	17,482,585	27,192,390	986,599	3,658,719	4,181,156	10,309,564	1,641,720	11,951,286	433,066	4,838,455	4,834,723	4,016,353	2,629,364	433,848	16,961,725	875,641	56,954,864	—
1860	1,356,688	1,878,156	3,270,516	152,957	323,136	608,877	1,091,032	730,642	1,821,674	100,277	499,568	701,523	435,306	1,080,227	519,777	2,941,817	216,106	8,143,988	636,422
1861	1,183,570	1,460,832	2,697,489	167,857	171,432	435,320	994,705	743,672	1,738,377	111,073	726,644	629,657	316,765	1,104,319	648,399	3,055,140	241,451	7,621,354	d. 522,663
1862	981,739	2,305,606	2,890,598	183,985	249,451	545,916	896,227	882,573	1,351,054	26,723	637,066	661,091	559,246	1,084,315	767,661	3,145,770	241,642	7,499,552	d. 121,799
1863	885,842	3,065,261	3,433,265	212,794	385,788	671,589	699,558	1,195,155	1,894,713	—	828,150	662,904	662,721	1,223,165	964,753	3,759,610	274,936	9,427,619	1,927,064
1864	1,000,000	3,065,577	3,642,218	211,216	537,498	748,448	756,087	1,295,419	2,054,669	9,314	852,136	759,544	630,142	1,302,457	929,374	3,960,836	333,478	9,996,046	568,388
1865	1,022,740	3,090,814	3,735,802	157,840	585,534	746,629	888,784	1,402,277	2,040,913	250,694	759,575	577,462	359,463	1,607,074	674,744	3,254,519	457,162	9,488,396	d. 509,650
Total -	23,143,151	38,767,532	60,422,057	2,569,142	6,922,106	9,266,693	20,942,890	7,861,458	28,656,599	982,514	12,893,422	8,760,923	8,350,901	9,440,921	4,938,556	42,050,008	2,992,885	184,121,549	—

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APPENDIX, Foreign (11.)

TABLES showing the COAL PRODUCE of the UNITED STATES of AMERICA from the Year 1860.

EASTERN PENNSYLVANIA.—HARD ANTHRACITE.

Year.	Schuylkill.	Lehigh.	Pinegrove.	Shamokin.	Wyoming and Lackawanna.	Aggregate.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1860	3,234,844	1,821,674	145,181	201,108	3,114,162	8,316,969
1861	2,644,402	1,738,387	168,148	241,451	3,243,730	8,036,118
1862	3,236,330	1,278,801	209,851	241,642	3,291,037	8,307,661
1863	3,703,964	1,894,713	203,991	274,936	3,777,447	9,855,051
1864	3,763,874	2,053,506	204,000	333,478	4,083,053	10,437,911
1865	3,335,916	2,291,017	157,840	457,162	3,341,158	10,083,093

SEMI-ANTHRACITE AND BITUMINOUS.

Year.	Lykins Valley.	Treverton.	Broad Top.	Blossburg.	Barclay.	Aggregate.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1860	176,274	90,448	187,853	97,571	27,718	579,868
1861	170,392	46,656	272,709	112,713	40,835	643,205
1862	177,121	63,223	353,606	179,334	52,779	806,063
1863	141,282	62,000	305,678	226,183	54,116	789,259
1864	129,973	66,000	336,645	353,124	62,010	997,752
1865	—	—	315,996	—	—	—

MARYLAND (CUMBERLAND), SEMI-ANTHRACITE AND BITUMINOUS.

Year.	Tons.
1860	666,572
1861	269,674
1862	317,634
1863	748,345
1864	657,996
1865	522,356

SUMMARY OF 1864.

	Tons.
EASTERN PENNSYLVANIA:—	
Hard Anthracite	10,437,911
Semi-Anthracite and Bituminous	997,752
MARYLAND (Cumberland):—	
Semi-Anthracite and Bituminous	657,996
	12,093,659
The other coal producing States	2,500,000
TOTAL COAL PRODUCE OF THE UNITED STATES OF AMERICA	14,593,659

APPENDIX, Foreign (12.)

OFFICIAL RETURN made January 1844, showing the progressive IMPORTATION and PRODUCTION of COAL in the UNITED STATES for the twenty-four years ending 1842.

The "foreign imports" represents the quantity supplied to the States from Great Britain. "Virginia," is quantity of bituminous coal wrought and shipped at Richmond in Virginia. The "anthracite" given is the production of the State of Pennsylvania.*

Years.	Foreign Imports.	Virginia.	Anthracite.
	Tons.	Tons.	Tons.
1821	22,123	—	1,073
1822	34,523	46,214	2,240
1823	30,433	39,255	5,823
1824	27,223	59,857	9,511
1825	25,645	59,571	34,393
1826	35,605	79,143	48,047
1827	40,257	75,643	63,434
1828	32,303	89,357	77,516
1829	45,393	83,357	113,083
1830	58,136	91,786	174,134
1831	36,509	93,143	176,529
1832	73,967	117,878	361,971
1833	92,432	142,587	461,348
1834	91,626	110,714	376,636
1835	49,969	96,433	560,758
1836	108,432	110,714	663,428
1837	152,450	100,000	881,479
1838	129,063	96,428	739,293
1839	181,521	85,714	819,237
1840	162,867	78,571	865,414
1841	155,394	71,071	958,899
1842	133,247	68,750	1,108,000

* Extract from Collections relative to the Collieries and Coal Trade of the Counties of Durham and Northumberland, vol. xi.

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REPORT

92

OF THE

ROYAL COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

SPONTANEOUS COMBUSTION OF COAL IN SHIPS,

TOGETHER WITH

APPENDIX, MINUTES OF EVIDENCE, AND INDEX.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
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COMMISSION.

VICTORIA R.

Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith.

To Our right trusty and well-beloved Councillor Hugh Culling Eardley Childers, Our trusty and well-beloved Sir George Elliot, Baronet, Our trusty and well-beloved Henry Hussey Vivian, Esquire, Our trusty and well-beloved Frederick Augustus Abel, Esquire, Fellow of the Royal Society, Our trusty and well-beloved Richard Cory, Esquire, Our trusty and well-beloved George Duncan, Esquire, Member of the Committee of Lloyd's Register, Our trusty and well-beloved John Fenwick, Esquire, one of the Elder Brethren of the ancient Corporation of the Trinity House, Our trusty and well-beloved John Ferguson, Esquire, Our trusty and well-beloved Charles Icely, Esquire, Our trusty and well-beloved John Percy, Esquire, Fellow of the Royal Society, and Our trusty and well-beloved William Young, Esquire, greeting.

Whereas We have deemed it expedient for divers good causes and considerations that a Commission should forthwith issue to make inquiry with regard to the causes of the spontaneous combustion of coal in ships, and the remedies which it may be possible to adopt for preventing and guarding against the same.

Now know ye, that We, reposing great trust and confidence in your ability and discretion, have nominated, constituted, and appointed, and do by these presents nominate, constitute, and appoint you the said Hugh Culling Eardley Childers, Sir George Elliot, Henry Hussey Vivian, Frederick Augustus Abel, Richard Cory, George Duncan, John Fenwick, John Ferguson, Charles Icely, John Percy, and William Young, to be Our Commissioners for the purposes of the said Inquiry.

And for the better enabling you Our said Commissioners to make the said inquiries, We do by these Presents authorize and empower you, or any five or more of you, to call before you, or any five or more of you, such persons as you may judge necessary by whom you may be the better informed of the matters herein submitted for your consideration and every matter connected therewith, and to inquire of and concerning the premises by all other lawful ways and means whatsoever.

And also to call for and examine all such books, documents, papers, or records as you shall judge likely to afford you the fullest information on the subject of this Our Commission, and to inquire of and concerning the premises by all other lawful ways and means whatsoever.

And We do further by these presents authorize and empower you, or any five or more of you, to visit and personally inspect such places in Our United Kingdom as you may deem expedient for the more effectual carrying out of the purposes aforesaid, and to employ such persons as you may think fit to assist you in conducting any inquiry which you may hold.

And Our further will and pleasure is, that you, or any five or more of you, do, with as little delay as possible, report to Us, under your hands and seals, upon the matter referred to you as aforesaid, and that you may have power to certify unto Us from time to time your several proceedings in respect of the matter aforesaid if it may seem expedient for you so to do.

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And We do further will and command, and by these presents ordain, that this Our Commission shall continue in full force and virtue, and that you Our said Commissioners, or any five or more of you, shall and may from time to time proceed in the execution thereof, and of every matter and thing therein contained, although the same be not continued from time to time by adjournment.

And for your assistance in the execution of these presents, We do hereby authorize and empower you to appoint a Secretary to this Our Commission to attend you, whose services and assistance We require you to use from time to time as occasion may require.

Given at Our Court at Saint James's, the Second Day of April 1875, in the Thirty-eighth year of Our Reign.

By Her Majesty's Command.

RICH^{D} ASSHETON CROSS.

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REPORT.

TO THE QUEEN'S MOST EXCELLENT MAJESTY.

WE, Your Majesty's Commissioners, appointed "to make inquiry with regard to the "causes of the spontaneous combustion of coal in ships, and the remedies which it "may be possible to adopt for preventing and guarding against the same," humbly submit to Your Majesty, in accordance with Your Majesty's commands, this our Report on the matters referred to us.

Origin of the Inquiry.

On entering upon this inquiry, a correspondence, commencing in April 1874, was laid before us by the Secretary to the Board of Trade, between that Department, the Committee of Lloyd's, and the London Salvage Association.

Correspondence between Board of Trade, Lloyd's, and London Salvage Association.

From this correspondence, which is appended to our Report, it appears that in April 1874, the Board of Trade decided to hold no more inquiries, under the Merchant Shipping Act, into casualties caused by explosions or fire in coal-laden vessels, for the reason that the finding of their courts, which invariably took the form of an exoneration of the ship's officers and a recommendation in favour of better ventilation, appeared to be entirely disregarded both by shipowning and underwriting interests.

Later in the year the Committee of Lloyd's, having furnished to the Board of Trade a return of the casualties to coal-laden vessels during the preceding 16 months, drew attention to the serious increase in the risk to life that appeared to be involved in the coal trade, and urged renewed investigation into such casualties, in order that the causes of these spontaneous combustions, hitherto so variously accounted for, having been ascertained and made public, such conditions in coal cargoes as were shown to be dangerous might, as far as possible, be provided against.

Unsatisfactory result of statutory inquiries held under the Board of Trade.

The Board of Trade still demurred to a renewal of their inquiries on the ground that no new facts were ever elicited, and that the conclusions, to which the courts had for years invariably arrived, had apparently been productive of no practical results. They submitted that there was no guarantee that the shipping interests would, in the future, pay more regard to the recommendations of the Courts of Inquiry than they had done in the past; and they suggested that some serious steps should be taken by those who own, manage, and insure these ships and cargoes, to profit by the facts already proved, and to secure the safety of their vessels by better ventilation, by the provision of means for extinguishing fire, and by caution in the description and condition of the coal shipped.

To this the Salvage Association replied by pointing out that the Courts of Inquiry hitherto held were not so constituted as to command the confidence of those concerned in the coal trade; that inquiries conducted, perhaps, by a justice of the peace and two assessors, were not calculated to elucidate a subject so difficult in itself, and rendered further obscure by the great conflict of opinions concerning it. They observed that the facts, which the Board of Trade alluded to as proved at these inquiries, were held generally to have been merely discussed, the conclusions arrived at by the court being of far too uncertain a character to be accepted or acted upon with decision. They therefore strongly urged that an inquiry should be held by a Commission consisting of men of high scientific attainments, and especially acquainted with the nature of coal in all its conditions, and of men acquainted practically with coal both at the pit and in the ship's hold. They pointed out that the result might be to fix with a certainty, absolute or qualified, the causes of this dangerous combustion of coal in ships, thereby attaching to the proper persons the responsibility for due precautions.

They expressed their confidence that the recommendations of such a Commission would receive attention and consideration from underwriters, shippers, and shipowners; and in support of this opinion they referred to a letter from Sir John Pirie & Co., strongly advocating an inquiry, so constituted, into the causes of spontaneous ignition, the best means for its prevention, and the most effective method for its extinction.

This proposal was referred by the Board of Trade in January 1875, to the Committee of Lloyd's, who expressed their hearty concurrence; and effect was given by Your

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Majesty, to the suggestion,—so strongly urged in this correspondence on Your Majesty's Government,—by the appointment of a Royal Commission.

General Condition of the Export Coal Trade and the Extent and Circumstances of the Casualties from Spontaneous Combustion.

Information collected.

In the first instance it appeared to us desirable to collect information bearing on the general condition of the export coal trade, the methods of shipment employed at the various ports, the descriptions of coal exported, and the fittings employed in coal ships either for the ventilation or preservation of the cargoes. We also endeavoured to obtain statistics showing, as far as possible, the exact extent of the evil we were to deal with, and the circumstances in which it generally occurred.

Return of casualties, 1874 and 1875.

For this purpose we first obtained from the Committee of Lloyd's a list of the coal-laden ships which had been subject to casualties from fire in the year 1874, and by individual application to the owners and masters of these vessels we procured, so far as practicable, particulars in each case of the tonnage, class, size, build, age, and destination of the vessel, and of the name, tonnage, condition as to moisture and ventilation, and method of loading, of the coal carried, together with the circumstances attending the combustion.

A tabulated analysis of this return, which was subsequently continued for the year 1875, will be found in the Appendix.

Evidence, oral and documentary.

2ndly. We addressed a circular letter to the chambers of commerce at the principal coal shipping ports of Great Britain, requesting them to furnish us with lists of such shipowners, coal-shippers, masters, engineers, staithmen, and others, as they considered it would promote our inquiry to consult, either orally or by letter. The chambers of commerce responded with readiness to this request, and enabled us to obtain information by means of series of questions, copies of which are appended, from a large number of the most important interests connected with the coal trade. We examined some of the witnesses recommended to us by the Board of Trade, Chambers of Commerce, and others whose opinions were likely to be valuable, and we have further received evidence from officers, sent to us by the Admiralty, with regard to cases of spontaneous combustion and of explosion that have occurred in the coal bunkers of Your Majesty's ships, and in certain of the Government coal stores. The minutes of evidence are appended.

Lloyd's return of coal shipments for 1874, showing tonnage, destination, and casualties.

3rdly. We requested the Committee of Lloyd's to prepare for us a return which would show the number of coal shipments, and the quantities of coal shipped from British to foreign ports in 1874, dividing the shipments according to their destinations, classifying them according to the tonnage of the cargoes, and assigning to each group of shipments the casualties that had arisen from spontaneous combustion. This valuable return, the material for which was obtained from the "Bill of Entry Offices" at the ports, entailed great labour on those offices, and still greater on the clerical staff of Lloyd's, and we wish to take this opportunity of acknowledging the valuable assistance we have obtained from that Corporation in the statistical branch of our inquiry.

Scientific paper by Dr. Percy and Professor Abel.

4thly. We requested Dr. Percy and Professor Abel, two members of our Commission, possessing the requisite scientific knowledge, to draw up a paper which should describe, simply and clearly, the chemical conditions which tend to originate and develope spontaneous combustion and those which produce explosion. This paper, which we consider of great value in connection with our inquiry, is annexed to the Report.

General conditions of export coal trade.

From the information collected from these various sources it appears that the export of coal from the United Kingdom is steadily on the increase. In 1873, 12 million tons were sent out of the country; in 1874 nearly 13½ million; and, notwithstanding this exceptionally large increase, last year shows a further advance of half a million, or a total export of nearly 14 million tons.

But of these large quantities of coal which annually leave the country more than three-fourths are destined for European ports, and the returns for 1875 show that the increase in the export for that year is wholly in this direction.

How far the unusually large number of fires which occurred in 1874 in coal ships bound to distant and tropical ports, may, by alarming shippers and underwriters, have influenced the shipment of coal on long voyages, we cannot say; but it is remarkable that the export to Africa, Australia, the East and West Indies, and North and South America, which increased by 340,000 tons or over 14 per cent. in 1874, as compared with 1873, show a decrease in 1875 as compared with 1874 of upwards of

Shipment of coal to European, as com-

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190,000 tons, or nearly 7 per cent.; while the export to Europe which in 1874 increased at a lower rate than that to more distant ports (namely at not quite 10 per cent.) still shows an increase of 7½ per cent. in 1875, or a total of 11,400,000 tons as compared with 10,600,000 in 1874. Setting against this the decrease to distant ports we find an increase last year on the total export of coal from the country of over half a million tons. Of this increase more than half went to France which is by far our largest customer. pared with more distant, ports.

The coal thus annually exported from the United Kingdom is shipped chiefly from the Tyne, the Wear, the Mersey, and the Bristol Channel. The Scotch and Yorkshire ports also sending out a considerable amount. Comparative export of coal from the chief coal shipping ports of United Kingdom.

In round numbers, the following was the export from these ports in the years:

——	1873.	1874.	1875.
From the Tyne - -	Over 3 million tons	Over 3 million tons	Over 3½ million tons
„ Wear - -	Under 1½ million „	Under 1½ million „	Nearly 1¼ million „
„ Bristol Channel -	Over 3½ million „	Nearly 4 million „	About 3¾ million „
„ Mersey - -	Over ½ million „	Nearly ¾ million „	Under ¾ million „
„ Scotch ports -	Over 1 million „	Over 1¼ million „	Over 2 million „
„ Yorkshire ports -	Over ½ million „	Over ¾ million „	Over ¾ million „

Turning from the extent and conditions of the coal shipments for foreign export, we come to consider the extent and circumstances of the casualties from fire, occurring among them, which form the subject of our inquiry.

From the return prepared by Lloyd's to which allusion has already been made (and which is tabulated in the Appendix) it appears that among 31,116 shipments in 1874, amounting to 13,369,012 tons of coal, the casualties were 70. But of these shipments, 26,631, amounting to 10,513,181 tons of coal, were to European* ports, and only suffered from combustion in 10 cases. This leaves 60 casualties among only 4,485 shipments, amounting to 2,855,831 tons of coal to Asia, Africa, and America. Extent and circumstances of the casualties in 1874.

Again this return shows, to a startling extent, that the proportion of casualties traceable to spontaneous combustion increases *pari passu* with the tonnage of the cargoes. This becomes still more apparent when the European trade is deducted. The return then shows that there were, in 1874:—

2,109 shipments, with cargoes under 500 tons, in which 5 casualties occurred,—or under ¼ per cent.;

1,501 shipments, with cargoes between 500 and 1,000 tons, in which 17 casualties occurred, or over 1 per cent.;

490 shipments, with cargoes between 1,000 and 1,500 tons, in which 17 casualties occurred, or 3½ per cent.;

308 shipments, with cargoes between 1,500 and 2,000 tons, in which 14 casualties occurred, or over 4½ per cent.; and

77 shipments, with cargoes over 2,000 tons, in which 7 casualties occurred, or 9 per cent.

The casualties in vessels bound to San Francisco were the most remarkable. Deducting vessels under 500 tons (in which no cases of spontaneous combustion were recorded), the return shows 9 casualties out of 54 shipments. These also increase in proportion to the tonnage of the cargoes, till we arrive at the alarming fact that out of the 5 ships with cargoes of over 2,000 tons sent to San Francisco in 1874, 2 suffered.

Thus it becomes evident that spontaneous combustion has occurred principally in vessels carrying over 500 ton cargoes, bound to the West Coast of South America, San Francisco, or to Asiatic ports beyond the Mediterranean and Black Seas. Of such shipments over 4 per cent. suffered in 1874; and though they only amounted to 1,181 out of the 31,116 shipments for the year, yet among them occurred 51 out of the 70 casualties.

In conducting our inquiry into the causes of spontaneous ignitions in coal cargoes, the chief points which we have found ourselves called upon to consider have been:— Chief heads of inquiry.

1. Descriptions of coal dangerous for shipment on long voyages;
2. The breakage to which coal is subjected by the various methods of loading employed at the several ports;
3. The effect of moisture;
4. The through ventilation of coal cargoes;

* This includes all ports in the Mediterranean and Black Sea.

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5. The providing of means for testing the temperature of coal during the voyage; and
6. The question of explosions in coal cargoes, which, though not specifically referred to us, we have ventured to consider within the terms of our inquiry.

Evidence as to dangerous descriptions of coal.

1. *Descriptions of Coal dangerous for shipment.*—This is a very difficult, and delicate, and at the same time a very important, branch of our inquiry. There can be no doubt that certain kinds of coal are of such a quality as to be entirely unsafe for shipment at all, while other kinds should only be shipped for short voyages and under circumstances of great precaution. We desire, as far as possible, to contribute, with regard to these coals, any information which may be valuable in averting danger from life and property, and we would therefore direct attention to the evidence, as to the character of certain coals, given by Mr. Cooper Rundell, Mr. Derry, Mr. Harwood, Mr. Beynon, Mr. Bladon, Capt. Steinson, Mr. Roberts, Mr. Scott, Capt. Cawkitt, and especially by Mr. Glasbrook. All coals mentioned in evidence before us will be found in their proper places in the Index.

Difficulties in obtaining complete information as to character of coal.

It would, however, be of course impossible for us to cite with completeness or accuracy the various coals to be avoided, or their relative susceptibilities to spontaneous heating. The difficulties are two-fold, first, because coals of very different character in this respect are produced from the same colliery; and secondly, because the conditions of shipment may be totally dissimilar. Nor can chemical analysis be relied upon, in every case, to furnish conclusive evidence as to the tendency to ignition. On this subject a letter from Mr. Ferguson, Professor of Chemistry at Glasgow University, will be found in the Appendix.

We are, however, inclined to think that the character in this respect of each class of coal is pretty generally known in the locality where it is worked (see Mr. Bladon's evidence, Q. 1,557, 1,558, and 1,560); and we consider that what is most needed, to avoid the shipment of dangerous coal, is thorough inquiry on the part of coal shippers, into the character of the coal they propose to ship, and subsequently a careful scrutiny of the coal before shipment in order to ensure that the coal contracted for has been actually supplied.

On this point the evidence of Mr. Roberts, Inspector for the Peninsular and Oriental Company at Cardiff, is worthy of attention, and we would refer especially to the answers given by him in evidence to Questions 2,000–2,005.

It appears to us, therefore, most desirable that facilities should be provided for tracing more certainly and easily where the coal, shipped in any particular vessel, comes from. Such means of information, in the case of cargoes which had heated, would enable coal shippers to learn from the accumulation of experience the character of the coals with which they had to deal.

As it is at present, a cargo of coal is constantly taken without even a name being given to it. If heating occurs in such a cargo, the dearly bought experience may prove valueless, there being no means of tracing the coal with which the vessel was loaded.

Provision recommended for securing records of the descriptions of coal exported.

It is of course impossible to insist by law that shippers should inquire into the character of the cargoes they carry, but we consider that the means of doing so, where a cargo has proved dangerous to human life, should be secured. We would suggest, therefore, that, on the "specification (in lieu of shipping bill or Customs bill of loading)" which every exporter has to deliver to the officers of Customs within six days from the time of the final clearance of the ship, as provided by the 23 Vict., cap. 22, he should be required to state the denomination of the coal carried and where it comes from, as well as its quantity and value. The form, as at present drawn up (of which specimen is appended), requires him to state the "quantity and *description* of goods," "but the goods need only be described in accordance with the denomination in the "official list of British and Irish produce and manufacture exported," and in the case of these cargoes the denomination at present given is simply "coal." These specifications are noted at the Custom House in London, and kept with the ship's papers. Were the exporter required to name the coal, or, in a mixed cargo, the several descriptions of coal, loaded in the vessel, and the same penalty extended to a false statement in this respect as now attaches to a false statement of quantity, facilities would be given for tracing to its source, and inquiring into the character of, any cargo of coal in which spontaneous combustion might occur. We would observe that the information we propose to make compulsory is already voluntarily given in the specifications by several coal shippers, especially at the Welsh ports.

Suggestion that Inspectors of

Having made this practice general, we would recommend that whenever a vessel

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loaded with coal from a British port is reported to have suffered from spontaneous combustion, reference should at once be made to the Customs authorities for the description of the coal given by the exporter, and that it should then be the duty of the Inspector of Mines for the district from which the coal was stated to have come to inquire into the case.

Mines should hold inquiries into all cases of combustion occurring in coal from their respective districts.

This inquiry would not be of the character of a marine inquiry, nor need it interfere with any investigation which the Board of Trade might think it desirable to make. The Inspector would be directed to ascertain as far as practicable the particular seam or seams from which the coal was wrought, the natural character of the coal, its condition at the time of the casualty, the manner and condition in which it was shipped, and other circumstances.

Some legislative provision may be requisite to enable the Departments of Government concerned to carry out these recommendations, but with this exception we advocate no legislation on the subject of our inquiry.

Legislation.

In connection with the subject of dangerous coal, we desire to draw attention to certain evidence given before us bearing on the shipment of small or inferior coal, and of coal insufficiently cleaned.

Shipment of small or inferior coal, or of coal insufficiently cleaned.

Mr. Cooper Rundell, accountant to the Liverpool Underwriters' Association, who had collected for his employers a variety of statistics relating to spontaneous combustion in coal ships, was of opinion that want of care in the selection of coal had a good deal to do with the increase of casualties in 1873 and 1874 (Q. 134). He considered that "the coals shipped in 1874 were most probably not so free from pyrites and small "coal as in the case of the coals shipped in the preceding years" (Q. 135,) and that "the coal agents found a market for the inferior coal they were able to sell and get rid of" (Q. 136). He also pointed out that in consequence of the Mines Regulation Act, which came into force in 1873 and restricted the labour of children, a great many of the boys, who were formerly employed in cleaning and selecting the coal, were no longer available (Q. 137). He adds, "There has been a great demand "for coal, and a ready sale has been found for inferior and unclean sorts, which "would not formerly have been marketable. I have been told this, that formerly "men were fined for sending up bad coal, but that they are not fined for doing so "now. The pitmen, it is stated, would have been fined for sending up so much "bad stuff, and the stony and metallic part of the coal which did come up would be "carefully separated at the pit's mouth. Now the coal agent, in order to meet the "demand, appears to accept anything passed to him." (Q. 137 and 139.)

On the effect of the Mines Regulation Act, Captain Steinson was subsequently examined as follows: *Q.* "You mentioned that the boys who formerly picked out "the pieces of brassy coal no longer do so?—*A.* Yes." *Q.* "At what date was "the practice of employing boys to pick out the brassy pieces of coal discontinued?— "*A.* It has gradually been discontinued since the Mines Regulation Act came into "force." *Q.* "When did the Mines Regulation Act come into force?—"Within the "last two or three years." *Q.* "Those accidents have been more rife since the "cleaning of the coal has been neglected?—*A.* The men have been getting more "careless in every way since then; since they get the big wages they have been getting "more careless." *Q.* Are you of opinion that the coal has been much more carelessly "cleaned since 1872 than previously?—*A.* I will not say much more carelessly; it is "not so carefully cleaned." *Q.* "Have the places of these boys been filled by anyone "else?—*A.* There is a screener at each side of the screen; he is supposed to pick out "the brasses." *Q.* "Did the boys supplement those men?—*A.* The boys supple- "mented those men." *Q.* "Therefore there was a double check, now there is only a "single one?—*A.* Only a single one." (*Q.* 1736–1743.)

On the subject of the shipment of small coal, Mr. John Bladon, a coal shipper at Newport, said, "I think that the shipment of small coal at Newport in large quantities "is rather a new trade. I think that formerly the small coal shipped at Newport was "generally considered smith's coal, and it was generally sent to the various ports "round the coast, but the shipment of small coal for foreign districts is somewhat of "a new trade." (Q. 1559.) He further said, "There is no doubt that many fresh coals have come into the market within the last few years." (Q. 1560.)

2. *Breakage of Coal.*—This seems generally to be recognised in the trade as an evil to be guarded against; and in advocating the various systems of loading employed at the several ports, their relative merit in avoiding breakage has been always accepted by witnesses as the gauge of their efficiency. It is also important to observe that the experience, in this respect, of shipowners, masters, and shipping agents is strongly

Systems of loading in relation to breakage of coal.

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confirmed by the conclusions laid down in the paper drawn up by the scientific members of the Commission to which we desire to draw particular attention.

Visits of Commission to coal shipping ports.

So important did this question of the breakage of coal in loading seem to us, that we thought it desirable to visit the chief coal shipping ports, and inspect for ourselves the working of the various systems.

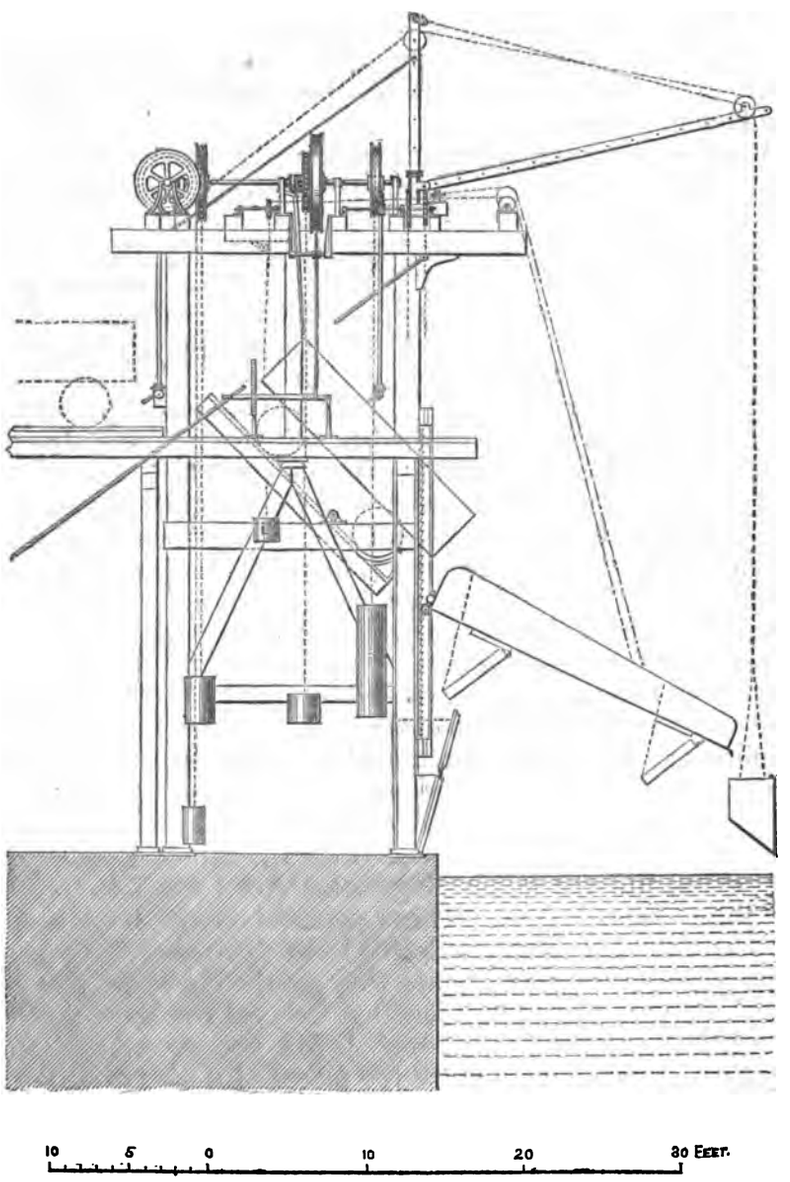
System of loading in South Wales.

Taking first the ports in South Wales, we found at Cardiff that, at the west and east docks, the coal is loaded from a high level by balance tips (also called drops), but that at the new basin the low level system, with hydraulic tips, has been adopted.

Balance tips or drops.

In the balance tips, of which the following are sketches,* the waggon runs from a high level of rails, 22 to 28 feet above the dock coping, on to a platform or cradle. This platform, in the tips of earlier construction, as shown in Fig. 1, is

No. 1.



supported by balance weights sufficient to raise it when carrying an empty waggon but unequal to the weight of a loaded one. These weights are connected to the platform by chains passing over pulleys at the top of the framing, upon which are breaks for controlling the motion of the platform. When a full waggon has been run on to the platform a suspended chain is hooked on to its tail, and the platform is lowered by means of the breaks until the waggon is tipped sufficiently. The coal is then discharged through an end door into an inclined shoot which reaches the ship's hatchway. The break is then released, and the platform, with the empty waggon, rises again to the level of the line of rails, and the waggon is run off into a siding, leaving the platform ready for a fresh load. The shoot down which the coal passes to the ship can also be adjusted to any height and at any angle, and has screens at

* For the particulars and sketches of these systems of loading in use at the South Welsh ports, we are greatly indebted to a paper by Mr. John McConnochie, of Cardiff, engineer to the Bute Harbour Trust.

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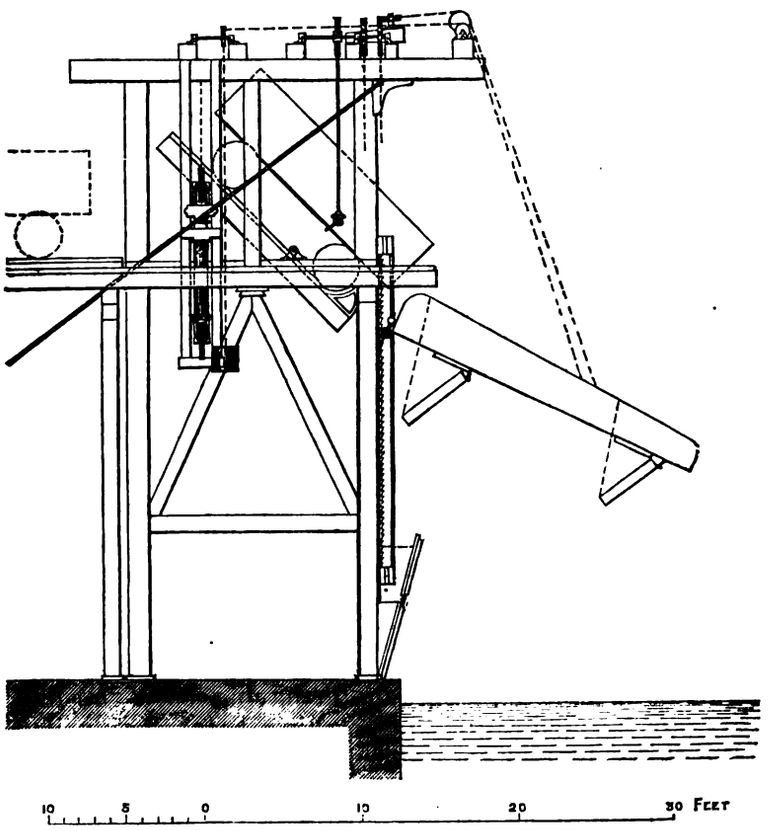
the bottom for separating the small coal, but these are not always left open. The shoot tapers towards the end, and is generally furnished with a door, so as to check the too rapid descent of the coal.

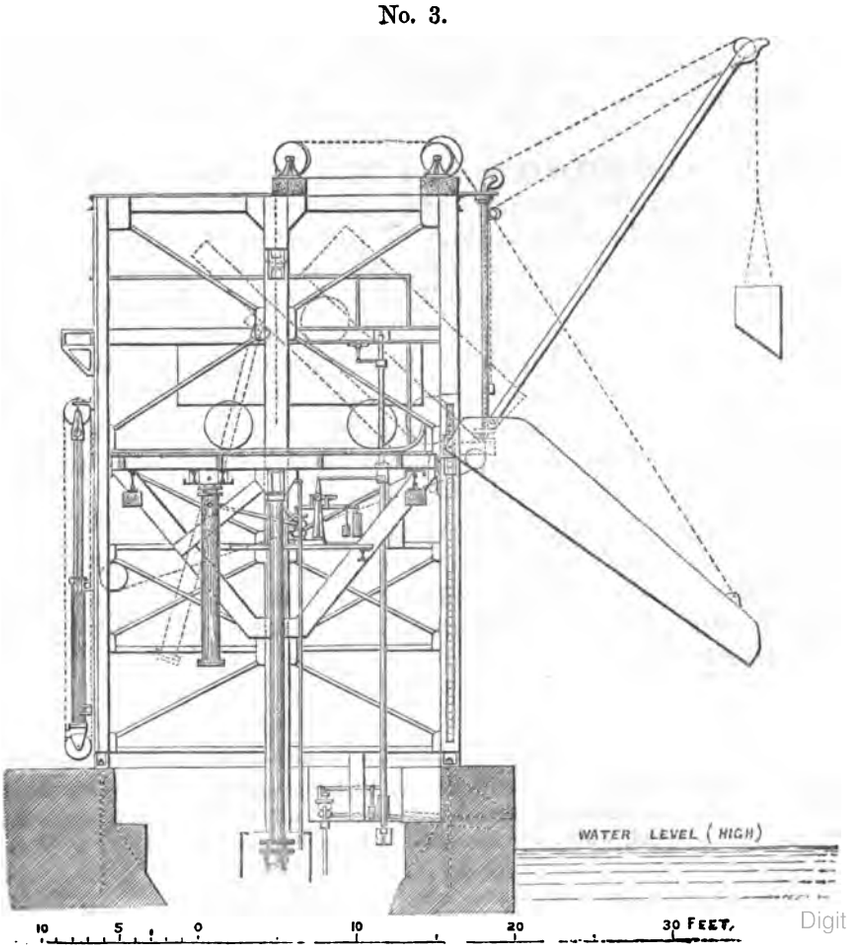
In the tips more recently constructed this system of tipping, by securing the tail end of the platform with a chain and lowering the other end to the shoot, has been superseded by the introduction of a hydraulic lift, which raises the tail end of the platform until the waggon is tipped to the desired angle of incline, as in Fig. 2.

No. 2.



At the new basin, served by the Great Western Railway, which comes into Cardiff on the low level, hydraulic tips have been fitted, of which the following is a sketch :— Hydraulic tips.

No. 3.



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By this method the waggon of coal runs on to a platform level with the quay, and is raised by a hydraulic lift to the height required to tip the coal down the shoot into the hold of the vessel, the waggon being tipped by hydraulic pressure as in the case of the high level balance tips. At low water it is unnecessary to raise the platform, and the cradle, with the rails upon which the waggon rests, is simply tipped, the tail end being raised by hydraulic pressure.

There is little to choose between the hydraulic and balance tips either in facility or rapidity of loading, each tip being capable of shipping about 560 tons of coal a day of 10 hours, and of course, as regards breakage of coal, the effect is the same in both cases.

Antibreakage boxes.

In any system of loading by tips this breakage necessarily occurs to the greatest extent in shipping the first waggon loads, when the coal has to fall from the mouth of the shoot to the bottom of the ship's hold. To meet this serious evil a machine called the anti-breakage box is much used at the south Welsh ports. (For illustration, see preceding sketches, Nos. 1 and 3.) It consists of a hopper-shaped iron box with a hinged flap for discharging at the bottom, and it is suspended from a crane close under the mouth of the shoot. The coal is then lowered by it from the shoot, a ton at a time, to the bottom of the ship's hold, until a cone of coal is formed under the hatchway, the top of which is level with the deck. The box is then removed and the coal allowed to run directly from the shoot. The use of the box, however, seriously delays the loading of the coal in its earlier stages, and unless insisted upon is liable to be neglected.

Box system of loading.

The same systems of loading in use at Cardiff are also prevalent at Newport and Swansea. At Cardiff and at Swansea the box system, introduced by Mr. Brunel, also exists, though to a very limited extent. At Cardiff we believe that the Powell Duffryn Co. are the only shippers who still use it. By this system the coal is loaded, at the collieries, into iron boxes, each containing $2\frac{1}{2}$ tons, and the boxes are conveyed, two on a waggon, to hydraulic hoists fitted on the quay. Each box is constructed with double doors at the bottom, and has three chains, one attached to the box itself and the two others to the doors. The waggon having been run under the hoist each box is lifted off it, and lowered through the ship's hatchway until the bottom of the box is close to the ship's bottom, or upon the surface of the coal already shipped. The doors are then opened by means of the chains and the contents let out. This system has fallen into disuse owing principally to the change on the railway from broad to narrow gauge. It is also less expeditious than the tips, and is generally considered a more expensive method of loading, but it clearly breaks the coal to a far less extent.

Systems of loading at Liverpool.

On the Mersey coal ships are generally loaded by the appliances of the Mersey Docks and Harbour Board. At Liverpool, at the high level railway, the coal is mostly put on board either by cranes, or by hand tips. The following are sketches* of these two methods (page 9).

The crane.

The crane, which loaded 363,000 tons in 1875 as against 73,000 loaded by hand tips, is worked by hydraulic pressure, and lowers the waggon-load of coal to the hatchway of the vessel, when the bottom of the waggon is opened and the coal is poured into the ship. The waggon cannot be lowered through the hatchway, as in the box system, so that the initial fall of the coal is the whole depth from the hatchway to the bottom of the ship, this fall decreasing as a cone is gradually formed, until the top of the heap is level with the lowest hatchway. It is then trimmed until the lowest compartment is filled, when the process is repeated. All the coal therefore in the lowest division of the vessel, supposing her to be a two or a three decker, must fall at least the distance from the uppermost to the lowest hatchway. Working at the quickest speed a crane can load 100 tons an hour.

The hand tips at the high level are used for shipping coal into flats; the coal by this method has a fall first from the waggon into the shoot, then a fall of about 6 feet at the turn of the shoot, and another fall from the end of the shoot into the vessel. The box system, as used at Swansea and Cardiff, exists also at Liverpool, but it is not largely resorted to.

* These sketches, and those of the systems in use at Birkenhead, have been kindly forwarded to us by the secretary to the Mersey Docks and Harbour Board. Also some interesting statistics, relating to the shipment of coals from the port of Liverpool, which will be found in the Appendix, page 118.

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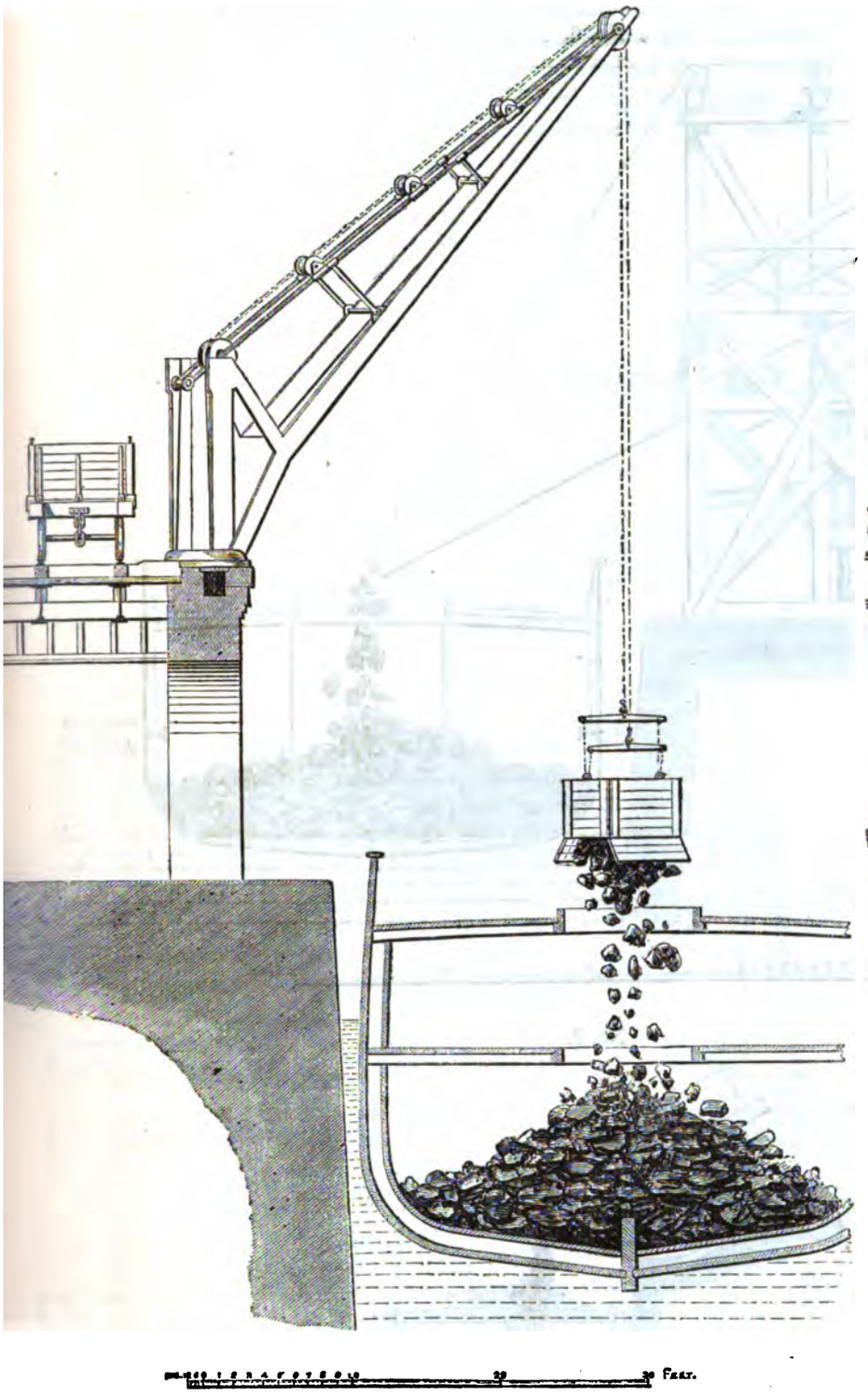

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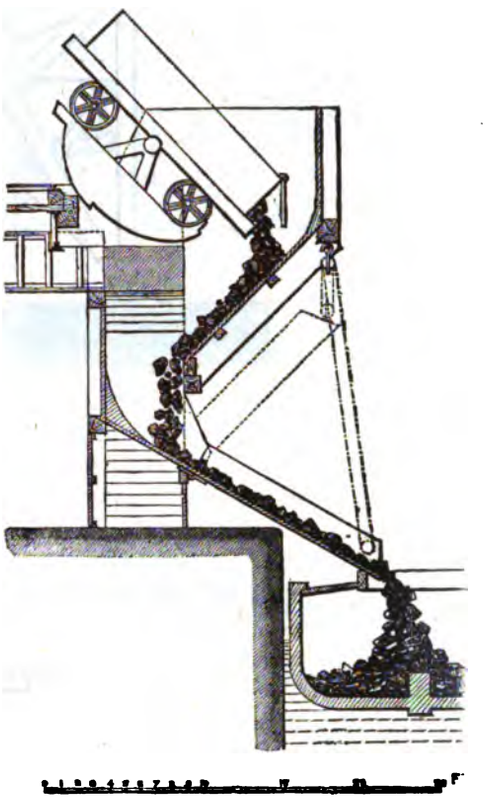

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Systems of loading at Birkenhead.

At Birkenhead where the lines are on the low level, the Mersey Docks and Harbour Board appliances consist of hydraulic hoists and hand tips, of which the following are sketches:—

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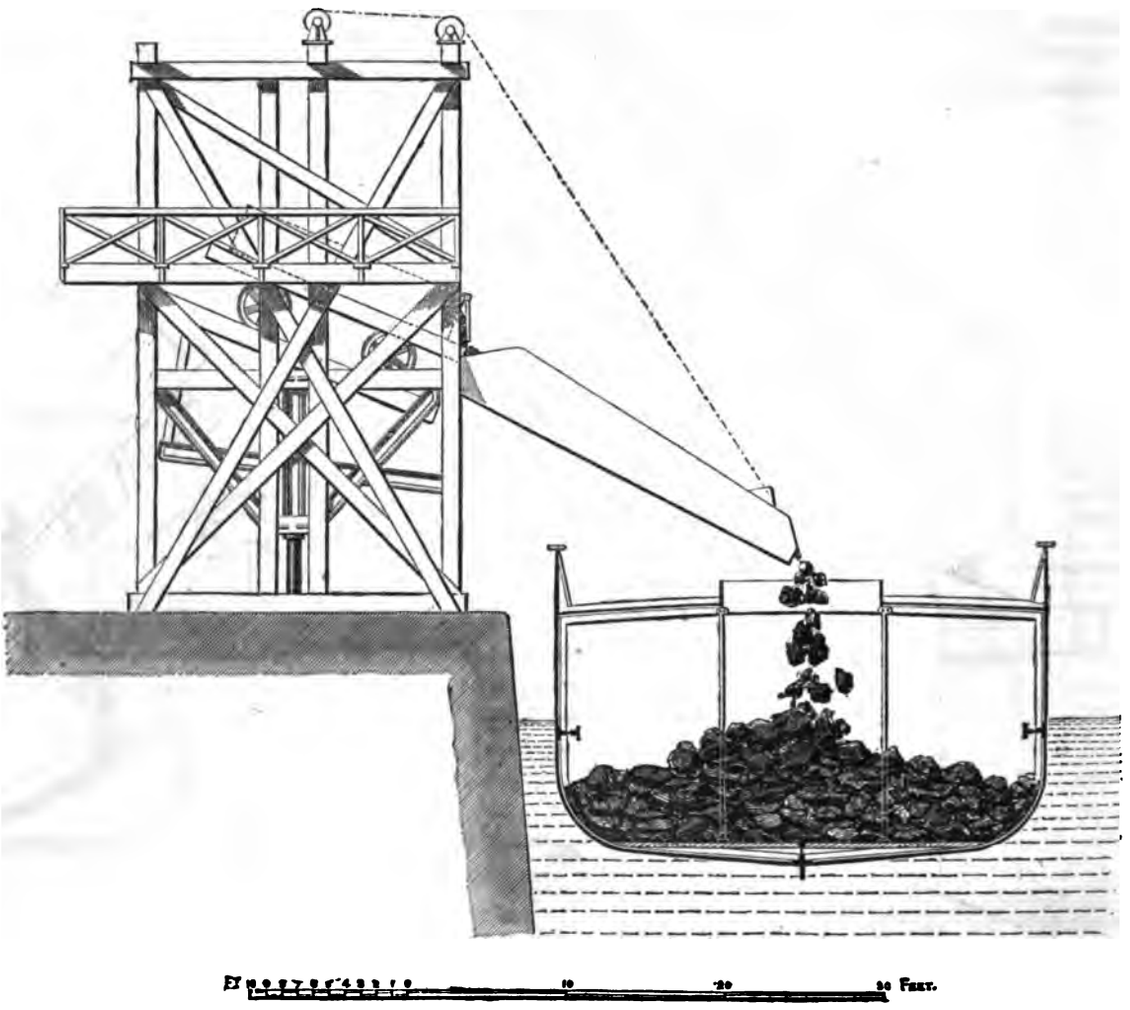

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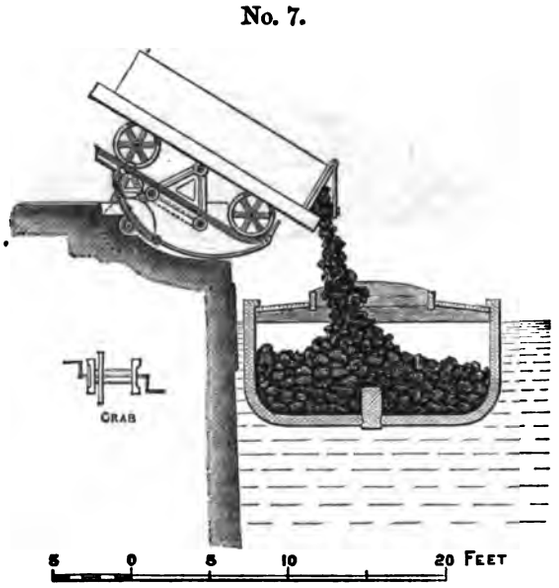

Hydraulic hoist.

The hydraulic hoist is somewhat similar in principle to that used in the Bristol Channel, but without the anti-breakage boxes. Only 77,000 tons were loaded by this method last year at Birkenhead, as against 363,000 shipped by the hydraulic cranes at Liverpool.

Hand tips.

The low level hand tips are only used for flats and lighters.

Loading by barrow.

Besides these methods upwards of 254,000 tons of coal were loaded during 1875 into sailing vessels by barrows.

By this method the coal is taken from the waggon in barrows which are lowered into the ship's hold, and there wheeled along planks to the place where the coal

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should be discharged, thus avoiding all the disturbance consequent on trimming and all serious fall of the coal. This is, however, by far the slowest process of loading, and we found that, to save the time and trouble required to lower the barrows into the hold, the coal was often discharged from the barrow down the hatchway.

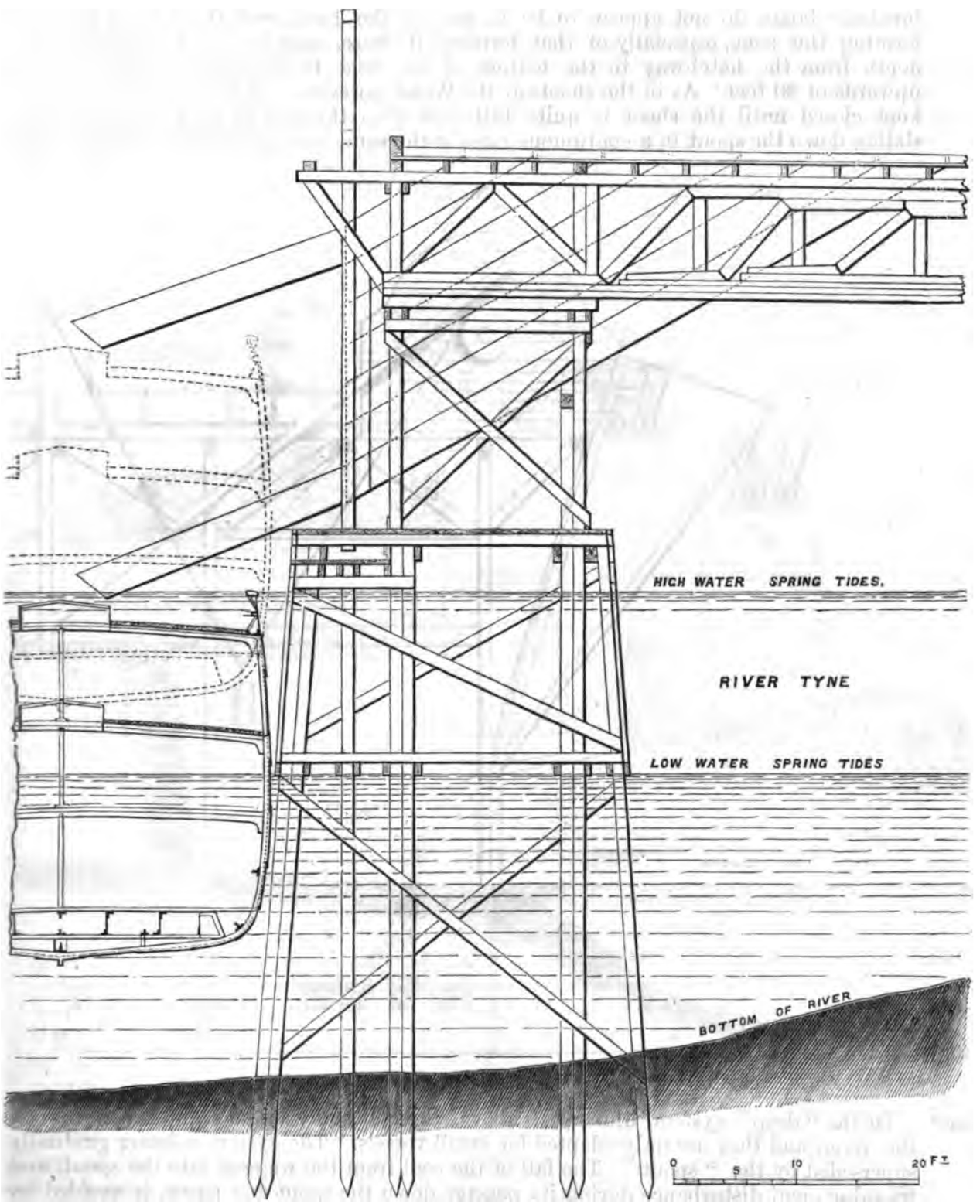
Systems of loading on the Tyne.

On the Tyne, the two systems in use are called the "spout" and the "drop."

The "spout.

The following is a sketch* of the coal staiths of the River Tyne Improvement Commissioners at Whitehill Point, and illustrates the "spout" system :—

No. 8.



By this method a sliding shoot is fitted to the mouth of whichever of the seven spouts, represented in the sketch, the height of the tide, and the depth of the vessel in the water, renders most suitable for bringing the end of the shoot directly over the

* The sketches of the systems of loading on the Tyne were kindly forwarded to us by Mr. Philip Messent, engineer to the River Tyne Improvement Commission.

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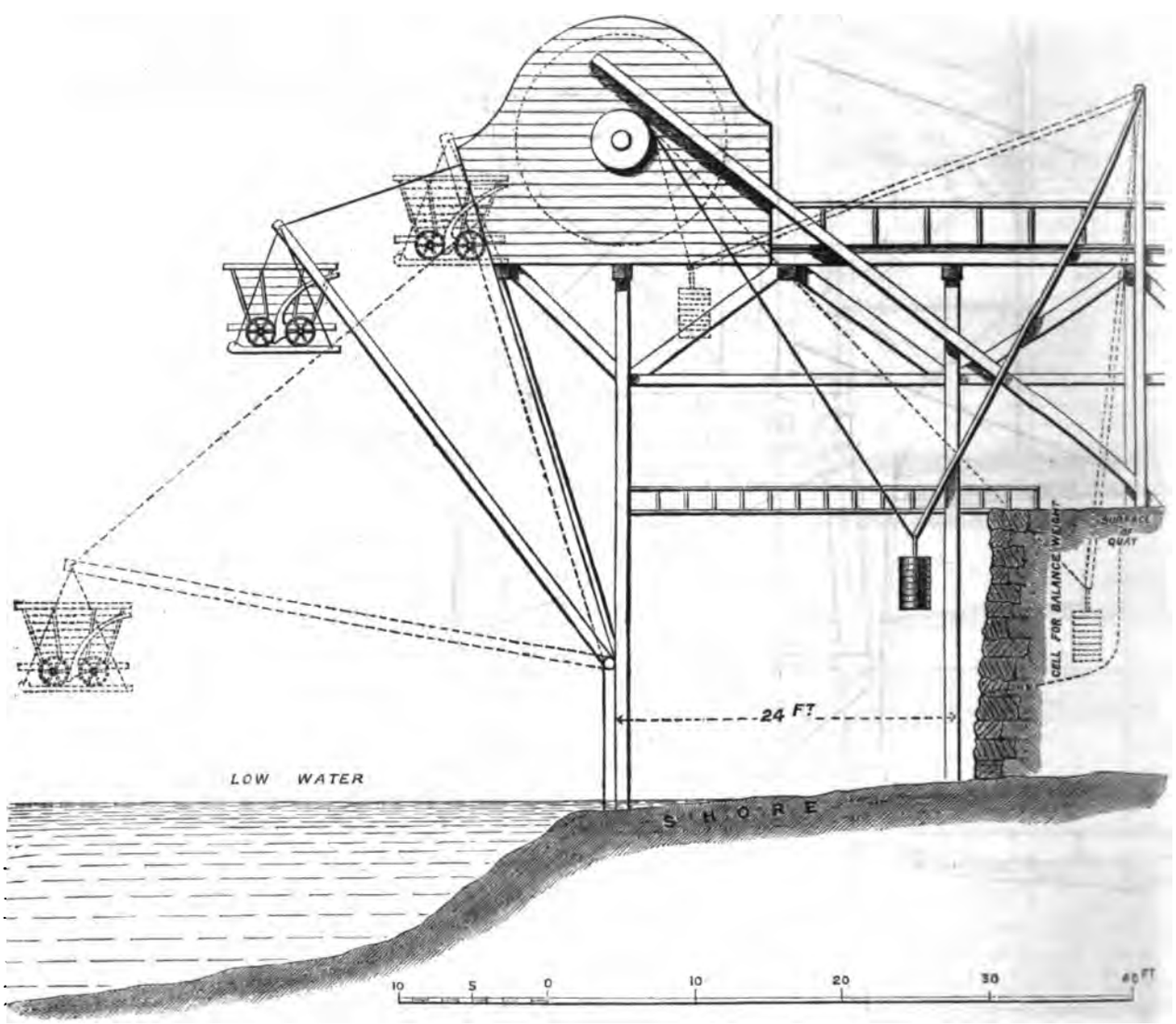
ship's hatchway. The waggon is then run over the entrance to the spout, and its bottom opened. The coal falls some three to five feet into the spout, slides down the incline and along the shoot a distance, varying according to the spout used, from 35 to 75 feet, and then drops from the end of the shoot into the ship's hold. The height from the line of rails on which the waggon stand to the ship's hatchway would vary according to tide from about 15 to 35 feet. The coal is not trimmed until a cone is formed reaching to the hatchway, when the fall from the end of the shoot becomes reduced to two or three feet. The trimmers then spread the coal as it is shipped, assisted by smooth steel plates, which they place on the sides of the cone. The anti-breakage boxes do not appear to be in use on the Tyne, and the fall of the coal forming this cone, especially of that forming its base, must be very considerable, the depth from the hatchway to the bottom of the hold being often in large vessels upwards of 20 feet. As in the shoots at the Welsh ports the end is in the first instance kept closed until the shoot is quite full, and then the coal is allowed to run out, sliding down the spout in a continuous mass at the same rate as it is filled in at the top.

No. 9.



The "Drop." Of the "drop" system, illustrated above, there are only six or eight specimens on the river, and they are only adapted for small vessels. The system is being gradually superseded by the "spout." The fall of the coal from the waggon into the spout, and its subsequent disturbance during its passage down the spout and shoot, is avoided by the "drop," which lowers the loaded waggon to the ship's hatchway. In this system, as with the spout, the coal is not trimmed until a cone is formed rising to the level of the ship's deck; but, as the waggons cannot be lowered through the hatchways, the initial fall of the coal forming this cone is represented, as in the case of the spout system, by the distance from the coaming of the hatchway to the bottom of the empty ship.

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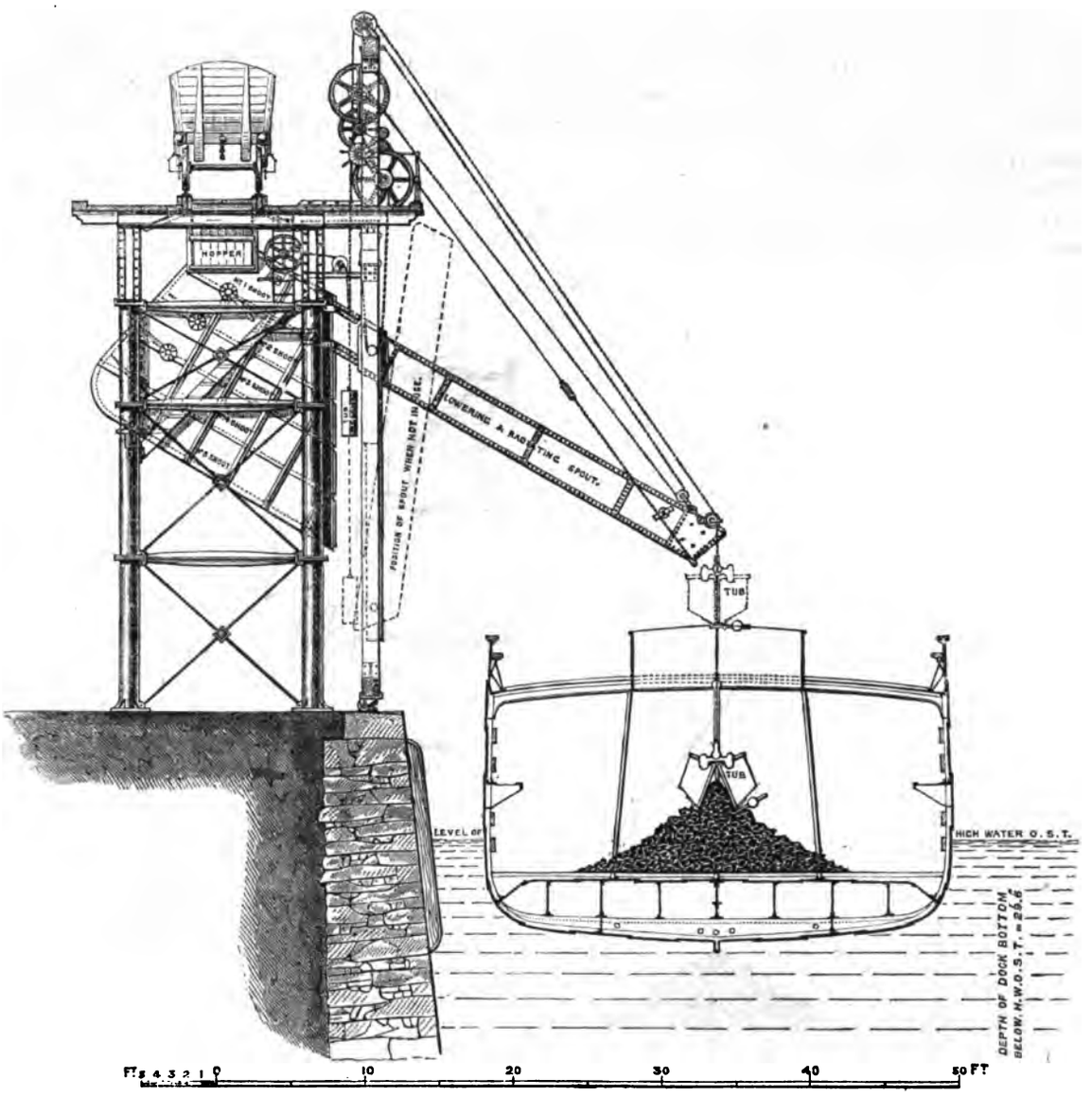
Captain Steinson,* coal inspector on the Tyne and Wear for the Peninsular and Oriental Co., and for the Admiralty, India Council, and Crown Colonies, described a lowering apparatus formerly used at Newcastle as satisfactory in result, but it had to be given up on account of the aversion of the men to working it, there being some risk of accident unless it were carefully handled. Captain Steinson had since adopted a system of platform on the lower beams in order to break the fall of the coal.

On the Wear the systems employed are the "Spout" and the "Gooseneck Drop." The following is a sketch† of the spouts at the new staith erected at Hendon dock.

Systems of loading on the Wear. The "Spout.

No. 10.



It is approached by heavy concrete retaining walls, nearly 600 feet long and about 40 high. From the retaining wall the staith is carried on iron columns decked with rolled iron and creosoted timber. The kip of the staith consists of two lines of rails which provide standing for 350 tons of coal. The lines for the loaded waggons have a fall towards the first spout, where they join, and then rise as a single line to the end of the gearing. The line for the return of the empty waggons is a single line with a return fall, so that the waggons are worked entirely by gravitation. There are two spouts, each with five shoots, to allow for the shipment of coals at various heights, according either to the rise of tide or the size of the vessel. The centres of the two sets of shoots are 50 feet apart, but, by a simple arrangement, the two spouts into which the shoots discharge can be moved in a lateral direction either to the right or left, so that the distance between the mouths of the spouts may be varied from 30 to 70 feet, in order to meet the requirements of any ship's hatches. The height of the rails above the high-water level of the Hendon dock is 43 feet, the height of the

* Captain Steinson has been coal inspector for the P. & O. Co. for over 14 years, and in 1864, 1865, and 1866 he inspected for the Egyptian Government. His evidence appeared to the Commission to result from long and valuable experience, and to deserve especial consideration.

† We are indebted to Mr. Wake, engineer to the River Weir Commission, for the sketches of the systems of loading in use at Sunderland.

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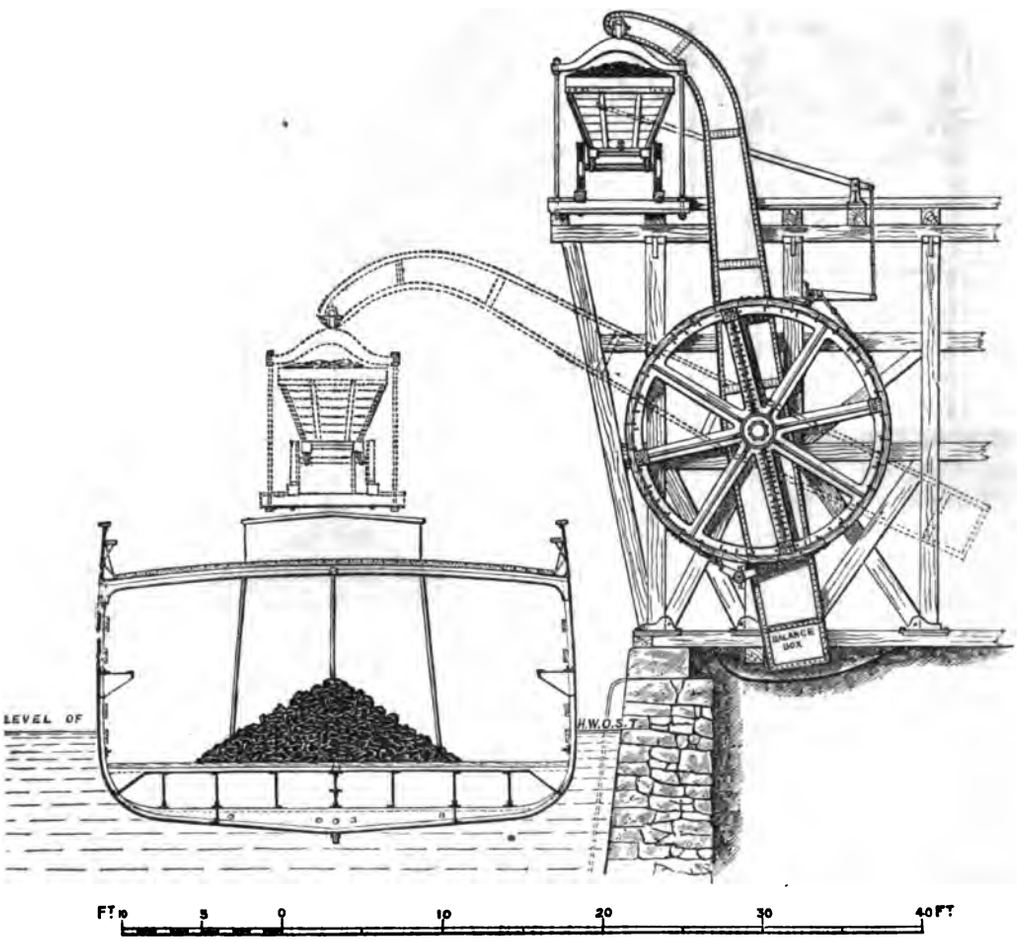
opmost shoot is 31 feet 6 inches above the same level, the height of the lowest shoot being 18 feet 9 inches, the dock having a depth of water of 29 feet 6 inches. During shipment, a set of eight waggons containing 32 tons of coal are brought down to the spouts, and the contents of two waggons are discharged simultaneously into the two hoppers, so that 16 tons of coal are run down each spout at one and the same time. By this means the spouts are capable of shipping at the rate of 500 tons per hour.

The breakage of coal by this system of loading must be very considerable, indeed greater even than by the tips, for when the waggon is tipped the coal runs with less force and fall from the end of the waggon into the spout or shoot than when it is allowed to drop in a mass through the bottom of the waggon into the spout. At Sunderland the fall from the waggon into the first shoot must be over six feet, and from the bottom of the waggon to the lowest shoot must be about 20 feet. The anti-breakage box or tub is used, as in South Wales, in the earlier stages of loading, for the formation of a cone of coal to lessen the breakage in the fall from the mouth of the spout into the ship's hold.

The "Gooseneck drop."

The "Gooseneck drop," of which the following is a sketch, is worked simply by the break wheels, and lever break, the weight of the loaded waggon taking down the drop to the distance required, where it is retained, by means of the break, until the

No. 11.



waggon is emptied. The lower ends of the lever are weighted so as to be a little heavier than the empty waggon, which by this means is brought up again to the level of the rails. The capability of a drop is said to be about the third of that of a spout for the shipment of coal. Its effect as regards breakage would be the same as that of the drops in use on the Tyne.

Comparison of systems with regard to the breakage of coal.

Of all these methods, the evidence tends distinctly to show that the "tips" and "spouts" conduce most to the breakage of the coal. In the system of loading by hoist or by crane the fall from the bottom or end of the waggon into the ship's hold is as great as from the mouth of the shoot or spout; but the coal, until released from the waggon, is literally undisturbed, and the fall from the bottom or end of the waggon, as the case may be, into the spout, together with the concussion of the coal in its passage down the spout, is avoided.

Whatever additional breakage, however, has to be debited to the "tip" and "spout" systems on these accounts happens before the coal reaches the vessel, and is equal in its effect on the whole cargo, and though reducing the value of the coal, is of small

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importance with regard to spontaneous combustion, in comparison with the final fall of the coal into the ship's hold, an evil which attaches equally to both systems of loading, whether by spout or by crane.

In each system the fall of that portion of the coal which is first put on board, especially in large and therefore deep ships, is very considerable, and the consequent accumulation of small and crushed coal under the hatchways has, we believe, in many cases promoted spontaneous combustion.

Danger of accumulation of small coal.

It was to obviate, as far as possible, the breakage consequent on this fall that the anti-breakage boxes were introduced, and witness after witness advocated building a cone of large coal up to the hatchways, either by boxes or by baskets, in order to break the fall of the coal, and disperse the small coal as it comes down the spout. But even where a cone of average size coal is thus made, rising to the level of the highest hatchway, (which in a two or three decker seems hardly practicable,) still the continuous fall on this heap of the rest of the cargo, sometimes amounting to over 1,000 tons, gradually crushes or pulverises it. Moreover, as each load falls on this central heap, it is the large coal which runs down the sides and is trimmed away to the ends, while the smallest coal, fine slack and dust, clings to the heap where it falls, or gradually accumulates in a compressed mass under the hatchway. It is here that experience shows that spontaneous combustion generally originates; witness the cases of the "Oliver Cromwell," "Calcutta" "Euxine," "Pocahontas," and others.

Speaking of the "Oliver Cromwell," Mr. Price, a large shipowner, said that the coal fell "a very considerable height," and "was very much broken indeed." He continued: "I went into the hold of the 'Oliver Cromwell' when she was about half "loaded, and I noticed in the main hatchway, where the bulk of the cargo was coming "down, a great accumulation of small coal in a pyramidical shape, and I said to the "captain as I came up, 'I am thankful that I am not the owner of this cargo; "'there seems to be so much small in it.'" (Q. 1151). He added that the "Calcutta" and the "Euxine" (which were also burned) were loaded in exactly the same way.

In the case of the "L'Aqouhanna," loaded at Birkenhead, the captain said (Q. 2539), "The tip lifts a truck about 15 or 20 feet above the ship's deck; the coal runs in an "iron shoot, and by the time it gets into the hold it is smashed up, and a large body "of small coal always lies where it falls." Speaking of the cargo of the "L'Aqouhama" he said the coal having to fall a great height there was a great accumulation of small coal round the hatchways (Q. 2561).

Captain Cawkitt, the manager of the Liverpool Salvage Association said, "Most "of the burnings in the ships we have heard of have been under the main hatch, "and the bulk of the burnings have been in vessels that have been loaded under the "tips where the coal is broken, and where there has been a lot of small coal accumu-"lating round the main hatchway, and I believe in most instances the fire has been "proved to have originated about the main hatchway."

The evil of this accumulation of small coal was insisted on by many witnesses.

Mr. Cooper Rundell, accountant to the Liverpool Underwriters Association, stated, quoting from "Stevens on Stowage," that in South Wales it is the practice to dig out a quantity of small coal from the hatchway, after the vessel has completed her loading, and to replace it by larger coal, showing that there is a feeling that danger may arise from too large a surface of small coal.

Mr. Price, to whose evidence we have already referred, when asked whether he had any reason to believe that spontaneous combustion was more likely to occur in an accumulation of fine coal in coal cargoes, not only referred again to his own experience, but said that a shipmaster who had been in ships that had been on fire, and had attended three surveys of ships, that either came into Bombay on fire, or had taken fire while lying there with coal, told him that the fire in each case occurred about 5 feet from the skin of the ships in the region of the main hatchway, where there was an accumulation of fine slack to which he attributed the fires (Q. 1228, 1229); and though he acknowledges that the liability to breakage was to a certain extent got over, when once a cone was formed, he added, "I have always seen it "come up in a pinnacle of small coal to the very top, and as long as there is room "for it to run clear of the hatchways the big lumps of coal run down, and the small "coal generally culminates." (Q. 1290–1292.)

Mr. Hancock, of Bristol, said, "I think the danger of spontaneous combustion "arises from the small coal. I think the fire generally takes place in the hatchway, "underneath the drop, where the small coal is likely to accumulate" (Q. 1342 and 1353).

Mr. Scott, of the firm of Gillespy and Scott, read the following extract from a letter written by the master of the "Pocahontas," lost by combustion in 1874. "Four

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"Boston ships have been burnt this season within two months of each other, and "the accounts given are about alike as to the cause of the fire. In most every case "ships have taken fire in the hatchways, where the fine coal is. If ships could be "loaded so as to avoid the fine coals collecting in the hatchways, and some means "taken to prevent the coals breaking up, I do not think fire would occur." (Q. 2093.)

This serious danger, of an accumulation of small coal under the hatchways, which attaches both to the "tip" ("or spout") and "crane," is avoided if the vessel is loaded either by the box system or by barrow.

Accumulation of small coal avoided in loading by box system or by barrow.

The box system was strongly advocated by Mr. John Glasbrook, of Swansea (Q. 2212–2218), and was also commended by Mr. Robert Hancock, shipping manager to Messrs. Charles Hill and Sons, of Bristol and Cardiff (Q. 1331–1335). And speaking of the barrow system, Mr. Cooper Rundell believed in an entire immunity from combustion in vessels so loaded (Q. 116 and 117), whilst he gave some significant statistics as to the increased use of the "tip" at Liverpool, and of the subsequent increase of casualties in shipments from that side of the Mersey (Q. 76).*

Comparing the system of barrows with that of tips, Mr. Price said, "I have loaded "vessels on two or three occasions from Birkenhead by tips before I became alive to "the advantage of the better mode of loading," (Q. 1211) and when asked what he considered the advantage of loading by barrow, said, "Hitherto I have not done it "voluntarily, I have done it because it was a stipulation in my charters that that "mode of loading should be adopted, in future I shall always adopt it, because I "think the cargo is more equally distributed, the small coal does not get into a mass "in the region of the main hatchways, which is the locality where according to my "experience fires usually take place" (Q. 1214). He admitted, however, that the system was a very slow and expensive one, enabling, even with plenty of hands, only 250 tons a day to be put on board, whereas by tips 1,800 tons could be put on board in 48 hours (Q. 1205 & 1210).

Rapidity in loading.

But rapidity in loading is of course an important consideration, not only as a question of time, but also of expense, as shown by Mr. Cooper Rundell (Q. 157 to 163).

That the box and barrow systems are stipulated for in charters, and adopted by many shippers, although the process is in both cases much slower and generally more expensive than that of the tip or the crane, proves that the coal is far less subject to breakage when thus lowered into the ship. It is true that the Peninsular and Oriental Co., and others who use these methods, desire to minimize the breakage of the coal, not so much from any apprehension of spontaneous combustion, as for the purpose of maintaining the value of the coal. But in so doing it is clear from the evidence both of experience and of science that they also diminish the risk of casualty to their cargo from spontaneous combustion, since, apart from any accumulation of small coal, the less broken the coal is generally, the less liable it is to heat.

Breakage of coals deteriorating to its value as well as conducive to combustion.

We are therefore of opinion, with reference to the subject of our inquiry, that, in all methods of loading, the chief aims should be to subject the coal to as little breakage as possible, and to avoid any accumulation of small coal in the cargoes.

Tendency to overrate injurious effect of wet on coal cargoes.

3. *Moisture:*—Most of the witnesses who have come before us have strongly condemned the shipment, or carriage, of coal in a wet condition, and their experience, in this respect, is, to a certain extent, supported by the scientific evidence to which we would direct very careful attention. It would appear that the wetting of certain kinds of coal, more especially those containing pyrites, is active in promoting spontaneous combustion; but the statements of some of the witnesses lead to the impression that moisture has been credited with cases of combustion beyond the sphere of its operation; while, from other passages of the evidence, it appears to us that the influence of the water, existing to a greater or less extent, in all coal before it has been brought to the surface, has not been sufficiently recognised.

4. *Through Ventilation.*—If this had been the only question referred to us, the urgent need for this inquiry would have been completely demonstrated by the result.

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* From the statistics forwarded to the Commission by Mr. Cooper Rundell, which will be found in the Appendix, page 127, it appears that of the shipments from the port of Liverpool with 500 tons of coal and upwards, on voyages across the Equator or through the Suez Canal, in the years 1873, 1874, and 1875, 348 were loaded by tips, and 608 by hand. Among the 348 loaded by tips 21 casualties occurred, while only 4 casualties are recorded among the 608 loaded by hand.

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Conflict of evidence as to through ventilation.

The evidence before us of those connected with the shipment of coal, either as shipowners, shippers, or masters, shows a decided want of information as to the elementary causes of spontaneous combustion, and therefore of the real source of danger in through ventilation as explained in the scientific paper attached to this report; hence arises a considerable conflict of opinion.

Real danger of ventilation not understood by its opponents.

Even those who from extensive personal experience, had arrived at the knowledge that ventilation through the body of the coal was, in effect, rather injurious than otherwise, based their opposition to it solely on the grounds that it "fanned the flames" after ignition had taken place, or that the wood, of which the ventilators were generally made, ignited at a lower temperature than the coal, and thus hastened the catastrophe; but they always expressed their conviction that such ventilation could not but tend to prevent heating in the first instance.

Advocates of ventilation.

On the other hand, some thorough advocates of ventilation have given evidence before us.

When their views were based on personal experience, we think that the evidence of these witnesses showed a tendency to credit all cases of immunity from fire to the ventilation, and to attribute all cases of casualty in ventilated ships either to other causes, or to the inadequacy of the ventilation itself, not because they realised the fact that partial ventilation was an element of danger, but because they considered that the amount of ventilation, though beneficial as far as it went, had not been sufficient to keep the temperature low enough.

Spontaneous combustion and explosion confused.

Where ventilation was advocated on less practical grounds than those of experience, we observed a strong tendency (and this remark applies to the bulk of the evidence on this subject) to confuse spontaneous combustion and explosion. Many of the witnesses were under the impression that both results were produced by the same causes. For instance, Mr. William Darley, a gentleman employed by the Board of Trade as assessor in the cases of the "Zeno," "Berwick," "Marie Lee," and "Herbert Graham," on being asked (Q. 2812) "As to green coal, how does that produce *spontaneous combustion*?" replied, "When it is wrought from the pit it is full of gas; if it "is exposed to the atmosphere previously to being shipped, some of that gas is "emitted that would be otherwise retained, but when confined it becomes dangerous, "and ultimately heats."

We believe that this confusion of ideas may have caused many witnesses to treat ventilation as a safeguard against spontaneous combustion, having had reason to regard it as a safeguard against explosion; and a want of knowledge of the conditions productive of explosion, lead them, as in the case of Mr. Darley, to consider that this ventilation, even to guard against explosion, should be carried down through the body of the cargo.

Ventilation generally considered harmless, if not beneficial.

But between the thorough opponents and the consistent advocates of ventilation, the evidence shows a certain proportion of shipowners, masters, and coal shippers, who express themselves as having "no faith in ventilation," but as considering that it "could not do any harm." Many of the witnesses representing this class informed the Commission that they only ventilated their ships to satisfy other interests concerned. Thus, Captain Scurr, of the "Brenhilda," a thoroughly ventilated ship, said (Q. 308 and 309), "I would as soon go to sea with a ship that was not furnished with "ventilators as with a ship that had them."

Captain Kennedy when questioned about ventilation said, "I do not think it does "much good" (Q. 2546); and again, "I doubt the practical worth of ventilation at "all" (Q. 2554), nevertheless he habitually ventilated under advice from his owners "who considered it beneficial."

Again, Mr. Price, a large shipowner, when asked (Q. 1235) "Would the object of "adopting that mode of ventilation be to guard against fire, or to guard against explo-"sion," replied, "It would be rather to satisfy my underwriters than to guard against "anything; for I tell you candidly, that having been free from casualties, I simply "adopted that which the underwriters surveyors, and such like people, recommended "without looking at it critically or carefully at all. The first thing an underwriter "says to you when you are insuring a cargo of coals is, "Will your friends see, or "will you see, to the ventilation? They make a special point of seeing to the "ventilation."

Mr. Thomas Beynon, shipowner and coal merchant at Newport, said, "Personally "I have no faith at all in the ventilation of smelting coal," (Q. 1395); but when was suggested to him that he had subsequently in his evidence recommended a particular system of ventilation, he replied, "No; I stated the system I adopted, and I think in ships which I loaded at Liverpool we were obliged to adopt that plan by

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the Board of Trade," (Q. 1495.) In this, however, he was mistaken, the Board of Trade having laid down no absolute rule on the subject.

Captain Steinson, coal inspector at Newcastle for the Admiralty, India Council, Crown Colonies, and the Peninsular and Oriental Company, stated "that all Liverpool ships must be ventilated." (Q. 1598.) Later he said, "It is a curious thing that "none of the North country ships that I have had to do with, that have not been "ventilated, have been burnt. I was talking to an old captain who told me that he "had never had a casualty happen to a ship except in one case, and that was the "only time he ever ventilated the ship." (Q. 1698.)

Referring to the case of the "Oliver Cromwell," which was burnt, Captain Steinson said, "The 'Oliver Cromwell' was ventilated. The captain came and asked me how "I wanted the coal ventilated, and I said 'I do not want the coal ventilated at all, "'it is no business of mine;' on that he said, he was obliged to ventilate by the "charterparty. I said, 'Then ventilate according to the charterparty, but as far as "'my own opinion goes I would not ventilate at all.' He further said, 'The owners "'say she must be ventilated.' 'Then,' I said, 'Ventilate according to the owners' "instructions.' So he did ventilate according to the owner's instructions with shafts "up and down each hatchway, connected with fore and aft shafts." (Q. 1632.)

Further, Mr. Cooper Rundell, of the Underwriters' Association of Liverpool, gave evidence that "The Underwriters' surveyors at Liverpool have recommended a special "system of ventilation," and that "These surveyors go round the docks and give "information, amongst other things, to the underwriters, respecting the mode of "ventilation adopted." (Q. 91.)

Captain Sandeman, formerly surveyor at Liverpool to the London Salvage Association, and now surveyor under the Marine Department of the Board of Trade, said, with regard to ventilation, "I should say that under all circumstances it is desirable." Q. 2654.) And having explained in detail the various systems employed at Liverpool, he said, "Many shipowners in Liverpool hold that ventilation is of no advantage "whatever, and it was only under pressure that they were disposed to adopt it." (Q. 2647.)

The evidence given by letters on this subject from all parts of the kingdom in answer to the printed circulars issued, of which an analysis is appended, also shows the same prevalence of the adoption of ventilation, often against the convictions of the shipowners and masters concerned.

Injurious effect of recommendations made by courts of inquiry held by Board of Trade.

Such evidence leads us to fear that the statutory inquiries held during the last few years under the Board of Trade, with uniform result in favour of ventilation, have not been so ineffectual as that Department believed, but that, on the contrary, they have proved powerfully influential in a dangerous direction.

The practice of ventilation has greatly increased during these years. Charterers, insurers, and surveyors on behalf of Government, or of underwriters associations, or of shipping companies, are the classes most likely to be influenced by the repeated verdicts of such courts of inquiry; and the evidence goes far to show that many vessels, which if left to their owners or masters would have probably gone to sea unventilated, have, under pressure from these quarters, adopted systems of ventilation that cannot but have added to the risks they incurred.

Evidence against ventilation furnished by the cases of vessels that have suffered combustion.

Turning from the evidence of opinion to the evidence of fact with regard to ventilation, we find that the scientific conclusions expressed by Dr. Percy and Professor Abel receive confirmation.

Of the 70 ships that suffered in 1874, none are reported as not having been ventilated, while 38 are distinctly stated to have been ventilated, 35 of them being vessels over 500 tons. But the most startling illustration is furnished by the cases of four vessels "the Euxine," "Oliver Cromwell," "Calcutta," and "Corah." These ships, to which reference was made by several of the witnesses who appeared before us, were loaded under the tips at Newcastle, at the same time, with the same coal, and from the same seam, sometimes one ship being under the tip and sometimes another. They were each carrying from 1,500 to 2,000 tons of coal. The "Euxine," "Oliver Cromwell," and "Calcutta" were bound for Aden, the "Corah" for Bombay. The first three ships were thoroughly ventilated, the fourth was not ventilated at all. The "Euxine," "Oliver Cromwell," and "Calcutta" were all totally lost from spontaneous combustion. The "Corah" carried her cargo safely to Bombay.

Since this Commission has been sitting further, evidence in this direction has been supplied by the vessels "Theresa" and "Anglia." The "Theresa" (704 tons) sailed from Birkenhead for Rangoon with 920 tons of coal in September 1875, and became a total loss from spontaneous combustion when she had been at sea a little over two

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months. She was very extensively ventilated, having square venetianed deal ventilators in each hatch to the keelson, and a trunk-way on each side of the keelson, and three rose mushroom ventilators in each hatch. The following is an extract from a letter from her owner, Mr. Henry French, of Liverpool:—"When I heard of the loss "of the 'Theresa' I had another vessel (the 'Anglia,' 525 tons reg., classed A.E. 1 "Eng. Lloyd's) beginning to load 630 tons of the same kind of coals for Havanah. "The captain decided he would have no ventilation, and went without any. She "sailed 29 Jan. /76, and was 69 days on the passage, being 28 days before getting "clear of this land. He reported his coals very hot when discharging, but no signs of "fire, and the top of the coals seemed to be coated with a kind of scum like sulphur. "During the voyage his hatches were kept off when practicable. I mention the "above on account of the coals being from same pit, and being just the same time on "board as the 'Theresa's' cargo. One ship was ventilated, the other not."

Systems of ventilation inspected by Commissioners.

We have also personally inspected the methods of ventilation adopted at the various coal-shipping ports, and that inspection has further convinced us how feeble such systems are for any purpose, except for the introduction into the coal of one of the elements of spontaneous combustion.

The most ordinary method of ventilation consists of shafts, about 2 ft. square, nearly always constructed of wood, and in the majority of cases venetianed, which pass down through the body of the coal from the hatchways to the bottom of the vessel, where they lead into a box shaft running along the keelson or into a space below the platform. Sometimes these shafts are carried up through the hatchways and fitted with cowls, so as to form an up-cast and a down-cast for the current of air passing through them, but they are often only brought to the level of the deck, and are therefore closed whenever the hatches are on.

Papers from Nova Scotia.

Some valuable papers, forwarded with great courtesy to the Commission by Mr. Henry S. Poole, inspector of mines for Nova Scotia, on the subject of spontaneous combustion in the coals of that district, contain some striking and conclusive evidence on the injurious effect of ventilation as applied to coal on shore. We feel much indebted to Mr. Poole, both for the expression of his own views on this subject, and also for the trouble he has taken in collecting for us the experience of those whose papers he has inclosed. (See Appendix.)

Through ventilation condemned by scientific evidence.

We are therefore fully of the opinion of Dr. Percy and Professor Abel that, "the "evidence which has been submitted to the Commission on the subject of ignition "of coal cargoes, bears out generally the conclusion that it is inadvisable to attempt "*through ventilation* of cargoes in coal-laden ships."

5. *Provision for testing Temperature of Coal Cargoes.*—The papers forwarded from Nova Scotia by Mr. Poole, the Inspector of Mines, to which allusion has already been made, advocate the use of thermometers, to be lowered, by means of metal tubes, passing into the body of the coal, in order to test and register its temperature; and by this means some interesting statistics, which he incloses, in connection with the heating of coal in store, were obtained. Mr. Wright, the engineer-in-chief to the Admiralty, described to us, in his evidence, a similar plan adopted by the Government in their coal stores at Jamaica, and in the coal bunkers of Her Majesty's ships.

The use of thermometers recommended for testing temperature of cargo.

Papers from Nova Scotia, Admiralty and other evidence.

Mr. Robert Hancock, shipping manager to Messrs. Charles Hill and Sons, of Bristol and Cardiff, in his evidence on the case of spontaneous combustion in "Her Royal Highness," said, "We always instruct the master to ascertain the heat of the hold with the thermometer" (*Q.* 1326.) A registration of the temperature by means of thermometers, was advocated by other witnesses, among whom was Captain Steinson, who stated that he was very careful, when commanding a coal-laden ship, to observe the temperature every day, but that it was not customary to do so among the masters of coal ships.

6. *Explosions.*—We have not given any statistics on the subject of explosions,* because any return of explosions at sea would give a very inadequate idea of the extent of this evil, many, if not the majority, of these cases occurring in dock, or in harbour, sometimes even before the loading of the cargo is completed.

No reliable statistics as to explosions.

Mr. Beynon, in answer to the question,—

"Do you know any instance of explosion having occurred on a coal ship?" said,

* Particulars however of certain cases of explosion, forwarded by the Board of Trade and by the Admiralty, will be found in Appendix II. and III., pages 4 and 60.

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"I have known several in Cardiff, but I have not inquired into the particulars. The "mate of one ship, after the ship had been loaded, took a lighted candle into the "hold and an explosion occurred. I do not know the particulars. The ship had "been loaded four or six hours." (Q. 1491.)

And Mr. Charles Tully, a shipowner in Newcastle, when asked as to his experience of explosion from gas, replied:—

"I have known two or three instances on the Tyne, where after the gas coals had "been loaded and the hatches had been put down, immediately the vessel blew up "altogether, that is to say, within two or three hours afterwards. In those cases "the vessel had not begun her voyage, but the hatches had been put down, and the "coals being full of gas they caused an explosion." (Q. 444.)

The danger of explosion is much greater in some kinds of coal than in others, and there is more risk and injury to life from these catastrophes than from spontaneous combustion, because they occur too suddenly to admit of provision being made for personal safety.

But, on the other hand, it is much easier to provide against the occurrence of explosion than of combustion.

We have, under another head, shown how prevalent is a confusion of ideas between these two causes of casualty, and it cannot be too clearly understood that they originate from entirely distinct causes inherent in the coal.

It should also be borne in mind that the gas, which by its mixture with oxygen is productive of an explosive atmosphere, is a light gas, which will readily find its way to the surface of the coal.

Surface ventilation recommended to prevent explosion.

All it requires therefore, is to have free and constant egress from the surface of the coal into the open air, and the majority of the casualties seem to occur from making the gas dependent for this egress upon the hatchways, which, in the event of rain or heavy weather, are liable to be covered and battened down. The gas then accumulates between the surface of the coal and the deck, and, mixing with the air with which it is confined, forms an atmosphere which only needs the application of a flame to explode.

Every coal-laden ship should therefore be fitted with shafts or ventilators piercing the upper deck, but not carried down on to or through the coal, with cowls always trimmed so as to form a downcast and upcast for the current of air, which would then pass continuously, and in all weather, over the surface of the coal, carrying with it any explosive gas as fast as it is evolved.

Objections to carbonic acid gas as a means of extinguishing fire.

Steam or water recommended.

7. *Means for extinguishing Fire.*—Several methods for generating carbonic acid gas and applying it to the ignited portions of a coal cargo, have been proposed for our consideration. We consider, however, that although this gas might be useful, by excluding atmospheric air (which is essential to support combustion), yet it will not, as water does, exert any very sensible cooling effect; which is a point of vital importance in the case of a considerable mass of ignited coal. We are of opinion that water and steam are the only agents practically available for the purpose of extinguishing fire in coal cargoes.

Summary.

Having completed our inquiry into the various questions embraced by the terms of the reference to us, we beg to lay before Your Majesty a summary of the conclusions at which we have arrived:—

1. That certain descriptions of coal are intrinsically dangerous for shipment on long voyages.
2. That the breakage of coal in its transport from the pit to the ship's hold, the shipment of pyritic coal in a wet condition, and, *especially, ventilation through the body of coal cargoes*, conduce to spontaneous combustion, even though the coal may not be unfit for conveyance on long voyages.
3. That spontaneous combustion in coal cargoes would be less frequent, if regard were had by shipowners and underwriters to these facts.
4. That when coal is being carried on long voyages the temperature in the various portions of the cargo should be tested periodically by thermometer, and registered in the log.

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5. That, with a view to guard against explosion, free and continuous egress to the open air, independently of the hatchways, should be provided for the explosive gases, by means of a system of *surface* ventilation, which would be effective in all circumstances of weather.

6. That in order to make known the descriptions of coal liable to combustion, the Inspectors of Mines should be instructed to hold inquiry into all cases of spontaneous combustion occurring in cargoes of coal taken from their respective districts; exporters being required always to record on their specifications the denomination of the coals forming the cargo.

7. That no additional legislation with reference to the conveyance of coal by sea is required, unless for the purpose of giving effect to our proposals with regard to the inquiries by Inspectors of Mines, and to the fuller specification of coal entered outward at Her Majesty's Customs.

(Signed) HUGH C. E. CHILDERS.
GEORGE ELLIOT.
HENRY HUSSEY VIVIAN.
F. A. ABEL.
RICHARD CORY.
GEORGE DUNCAN.
JOHN FENWICK.
JOHN FERGUSON.
CHAS. ICELY.
JOHN PERCY.
WM. YOUNG.

J. M. CARMICHAEL,
Secretary.

18th July 1876.

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Paper by Frederick Augustus Abel, Esq., F.R.S., and John Percy, Esq., M.D., F.R.S.

The so-called spontaneous development of heat which occasionally takes place in coal, is due to chemical changes which certain substances occurring in it undergo through the agency of atmospheric oxygen, and which are liable to acceleration by some conditions attending the storage or transport of coal.

The substances, the oxidation of which is attended by the development of heat, are iron pyrites (and possibly some other combinations of sulphur), and some carbo-hydrogen compounds, forming part of the coal itself, which are comparatively readily oxidisable.

Iron pyrites is of almost universal occurrence in coal. The condition in which it exists differs considerably in different kinds of coal; in some it is distributed so as not to be detectable by ordinary inspection, in others it is in form of more or less conspicuous laminæ of a brass yellow colour; occasionally small distinct crystals of cubical form and bright metallic lustre are observed, and not unfrequently it is found in nodules (known as "brasses") and layers of considerable dimensions.

Iron pyrites, a compound of sulphur and iron known as disulphide of iron, occurs in the mineral kingdom in two crystalline forms, which are identical in chemical composition. Pyrites vary greatly as regards their stability or their liability to undergo oxidation by contact with the atmosphere. Some, after remaining unchanged during long periods of exposure, will undergo oxidation without any immediately apparent inciting cause. Others are perfectly stable, and with others oxidation follows with more or less rapidity upon their exposure to the atmosphere.

The presence of moisture in air promotes the oxidation of pyrites; it does so apparently by bringing the atmospheric oxygen into more intimate contact with the surfaces of the oxidisable material. Similarly, the absorption of moisture by mineral substances of laminated or porous structure, through which pyrites are disseminated, promotes the oxidation of the latter by bringing the atmospheric oxygen, which is dissolved by the water, into more intimate contact with the oxidisable material.

Thus, the oxidation of pyrites in alum schist is accelerated, in the manufacture of alum therefrom, by occasionally watering loose heaps of the mineral which are piled in such a manner that the access of air to the interior can be regulated.

The oxidation of pyrites (as in most instances of chemical action) is accompanied by the development of heat, which may accumulate to such an extent as to lead to the ignition of highly oxidisable constituents of minerals through which it is distributed. Heaps of alum schist exposed to the air and moistened will become heated to an extent to lead to the ignition of the carbonaceous constituents of that mineral, and similarly coal, through which pyrites are disseminated, may become heated to the point of ignition by the oxidation of pyrites disseminated through it.

Sulphur exists in coal in other forms of combination than that of iron pyrites. Thus sulphate of lime is occasionally disseminated through coal; the existence of sulphur in this form cannot give rise to the development of heat, as it is already in the completely oxidised or burnt condition; however, so far as is known they have not been found to possess any liability to spontaneous heating by oxidation. Some descriptions of coal or shale have been found to contain sulphur in somewhat considerable quantity in combination with carbon and hydrogen. An example of this is furnished by the so-called "resiniferous shale" occurring in Tasmania, which has been found to contain as much as five per cent. of sulphur in combination with carbon and hydrogen.

So far as is at present known, the spontaneous heating of coal is not ascribable to any tendency of such sulphur combinations to oxidation by atmospheric agency.

Pyrites appear therefore to be the only sulphur combinations occurring in coa. which by their oxidation, promoted by the presence of moisture and by mechanical conditions favourable to the accumulation of the heat developed by such oxidation, are liable to give rise to the so-called *spontaneous ignition* of coal.

Coal varies considerably not only in chemical composition, but in structure, some varieties being comparatively open and porous, others compact or laminated, and very friable or readily broken up.

Carbon in a finely divided or porous condition has the property of absorbing and condensing within its pores large volumes of certain gases, among which is oxygen.

Thus, wood charcoal which has been recently produced, or which has been freshly heated sufficiently to expel moisture and gases which it may have absorbed, will condense within its pores more than nine times its own volume of oxygen, and seven

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times its own volume of nitrogen, which it is capable of absorbing by exposure to the air.

The condensation of a gas by a porous body is attended by the development of heat, proportionate to the extent of that condensation. Moreover, the tendency to oxidation which carbon, and certain carbon-compounds existing in such a substance as charcoal, possess, is favoured by the condensation of oxygen within its pores, whereby the very intimate contact between the carbon and oxygen particles is promoted. Hence the development of heat and the establishment of oxidation occur simultaneously; the latter is accelerated as heat accumulates, and chemical action is thus promoted and may in course of time proceed so energetically that the carbon or carbo-hydrogen particles may be heated to igniting point.

A good illustration of this action is afforded by the very porous charcoal prepared for the manufacture of gunpowder. It has to be protected against rapid access of air for some considerable time after it has been removed from the carbonising retorts (by transferring it at once from the retorts to metal receptacles which are kept tightly closed for a number of days), otherwise the charcoal, though it may have been allowed to cool down perfectly, will speedily become heated upon exposure to air, by the action above explained, to such an extent as to ignite spontaneously. Even after the stick charcoal no longer exhibits any tendency to heating when exposed, its pulverisation by grinding has still to be delayed; otherwise, when the absorption and condensation of oxygen by the internal portions of the pieces of charcoal become favoured by the reduction of these to a fine state of division and the consequent exposure of large surfaces to the air, ignition of the charcoal will take place. (Instances of such ignition upon the mill beds at powder works are not unfrequent.)

The spontaneous ignition of oiled cotton or silk waste, or cloths, which is of not unfrequent occurrence, affords another illustration of the manner in which the heat developed by the action of atmospheric oxygen upon readily oxidisable substances, consisting chiefly of carbon and hydrogen, which are exposed to that action under conditions very favourable to it, will readily accumulate to an extent sufficient to give rise to ignition. The porous cotton or silk waste serve, in such cases of spontaneous ignition, as vehicles for exposing the readily oxidisable oil or grease in a finely divided condition to the air, and thus favouring its rapid oxidation.

The foregoing explanation of the manner in which the spontaneous heating and eventual ignition of certain carbonaceous substances by the action of atmospheric oxygen are brought about, has a direct bearing upon the spontaneous ignition of coal. The more porous and readily oxidisable portions of coal, which are known to be more or less largely disseminated through seams from different localities, undergo oxidation by absorption of atmospheric oxygen, and by the exposure of large surfaces to its action, and the heat developed by that action will accumulate under favourable conditions to such an extent as soon to hasten the oxidation and the consequent elevation of temperature, until some of the most finely divided and readily inflammable portions actually become ignited.

The breaking up of the coal which occurs for a more or less considerable extent before and during its shipment obviously favours the absorption of oxygen, and consequently increases a tendency to heating by the action above described.

In a series of valuable experiments on the weathering of coal, by Richters and others, it has been demonstrated that a considerable quantity of oxygen is absorbed by freshly gotten coal, and that carbonic acid and water are evolved from such coal after absorption of oxygen, while a portion of the oxygen absorbed is fixed by the formation of some solid oxygenated compound in the coal. Spontaneous oxidation of coal by the oxygen absorbed from the air is therefore satisfactorily established and is unquestionably one, if not the chief, cause of the spontaneous heating of coal.

Spontaneous ignition of coal, when due to the oxidation of the porous and readily oxidisable carbonaceous substances occurring in coal does not appear to be favoured by the presence of water in the coal or by its access to a cargo; on the contrary, these portions, by becoming wet, would have their pores more or less filled with water, and their power of absorbing oxygen would be proportionately diminished; hence the presence of water must be antagonistic to the oxidising action of the latter in many instances, though, when iron pyrites is present, it may promote or accelerate spontaneous heating as already pointed out.

The gases which are occluded (or confined in a more or less condensed condition) in coal, vary considerably in quantity and composition in different kinds of coal, and they also gradually undergo various changes in composition by exposure or keeping of the coal.

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Their chief inflammable constituent is marsh gas, and it is to the admixture of this gas with a *considerable* volume of air that *explosions* are due in freights or stores. In pits where explosions are liable to occur, the gas escapes either with more or less rapidity and force from fissures ("blowers"), or gradually from the freshly exposed surfaces of coal seams. When coal from such pits is brought to the surface it continues slowly to evolve inflammable gas for some time afterwards, especially if the coal be in large masses or stored in compact heaps.

If facility is not afforded for the ready escape or removal into the open air of the inflammable gas emitted from the coal composing a cargo or contained in bunkers on board ship, the spaces between the masses of coal, or any partially confined spaces not occupied by the coal but in close proximity to or communication with it, will in time become filled with a mixture of the gas with the air in those spaces, which, unless the former be present in very small proportions, would explode on the approach of a flame to it, and with a violence depending upon the proportion which the air bears to the inflammable gas which has become diffused through it.

As the application of flame (or of a body raised to a high red heat) is indispensable to the ignition of mixtures of air with the inflammable gas evolved from coal, it is obvious that *explosions* cannot occur spontaneously from this cause on board ship, but must be brought about by the accidental or incautious approach of a light to localities where the coal is stored, or where the explosive mixture is likely to penetrate.

If coal, from seams which are charged with marsh gas, is placed on board ship shortly after being raised from the pit, there is obviously great liability to the formation of an explosive atmosphere in the hold or bunkers, or spaces communicating with them, and every possible means should in such cases be had recourse to for facilitating the escape of gas from the coal into the open air.

But, as the gas requires a large admixture of air to render it violently explosive, it is obvious that any attempt to ventilate the coal by passing or drawing air into the *body* of the freight would be most likely to favour the production of a violently explosive mixture of gas and air. The only useful application which might be made of any special means of ventilation with a view to diminish the risk of *explosions* would be to pass a current of air *over* the coal and immediately into the open air, so as to accelerate the escape and removal of the inflammable gas.

As regards the application of ventilation with a view to reduce the liability to spontaneous *ignition* of a cargo of coal, the only useful object which could *possibly* be aimed at by ventilation would be the rapid abstraction of heat developed in the coal (by chemical changes set up as described) by causing cool air to circulate freely and rapidly throughout the *body* of a mass of coal. The attainment of such a result, even by powerful means of artificial ventilation, elaborately applied, and with the coal in the mechanical condition most favourable to its free permeation by air, appears, to say the least, very doubtful, and there can be no question that any system of ventilation practically applicable on board ship would fail to attain such a result, even disregarding the fact that the mechanical (finely divided) condition of much of the coal constituting a cargo is quite antagonistic to the free passage of air through its mass.

It does not appear practicable, therefore, to apply ventilation with any prospect of guarding against the accumulation of heat in some portion of a cargo of coal.

Such circulation of air as may be established even in the less compact portion of the cargo is not likely to have any valuable cooling effect, and the circulation, if there be any, must be very feeble among the more closely lying masses of small coal, so that heat, if developed in these, will accumulate undisturbed. Indeed, its development would possibly be favoured by the fresh supply of oxygen which a gradual replacement of the air surrounding those parts would convey, so that a period would be reached sooner or later when the development of heat would be most seriously promoted by ventilation, some time before actual ignition demanded the total exclusion of fresh air.

The evidence which has been submitted to the Committee on the subject of the ignition of coal cargoes bears out generally the conclusion to which the above considerations lead, namely, that it is inadvisable to attempt *through ventilation* of cargoes in coal-laden ships.

(Signed) F. A. ABEL.
JOHN PERCY.

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APPENDIX TO REPORT

OF THE

ROYAL COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

SPONTANEOUS COMBUSTION OF COAL IN SHIPS.

APPENDIX I.

Correspondence between Board of Trade, Lloyd's, and London Salvage Association.

Board of Trade to Salvage Association and Lloyd's.

Board of Trade, Whitehall Gardens,

Sir, April 22nd, 1874.

I am directed by the Board of Trade to transmit to you for the information of your Association the accompanying copy of a statement of inquiries, held under the Merchant Shipping Act, into casualties caused by explosion or fire to coal-laden vessels in 1873.

The result of these inquiries is always the same, viz., the officers are exonerated, the court recommends better ventilation; and as the Board of Trade have no reason to believe that the recommendations of the courts have any effect in inducing owners to adopt a better system of ventilation, or render underwriters unwilling to insure vessels of this description, they have decided not to order inquiries in such cases in future.

I am, &c.

J. A. W. Harper, Esq., Salvage Association. (Signed) Thomas Gray.

Inquiries held in the year 1873 into Casualties occurring to Vessels through Combustion of Cargo (Coals), with Suggestions of Courts.

'Zeno," steamship.	Lost in the Bay of Biscay, on the 13th May, through explosion of coal gas.	Inquiry held at Hull 11th June; master acquitted; Court suggested the adoption of stringent measures for proper ventilation of coal-laden ships.
"Berwick," steamship.	Explosion of coal gas on the 9th of May, off the Dudgeon.	Inquiry held at Greenwich on the 26th September; master exonerated; means recommended for ventilating holds of coal-laden vessels.
"Herbert Graham," barque.	Destroyed by fire off Magellan Straits. Spontaneous combustion of cargo of coals.	Inquiry held at Newport (Mon.); master exonerated; means of ventilation suggested.
"Minnie Graham," barque.	Destroyed by fire in the South Pacific, through combustion of cargo of coals.	Inquiry held at Newport; master exonerated; means of ventilation suggested.

A similar letter was addressed by the Board of Trade to the Secretary of Lloyds'.

Salvage Association to Board of Trade.

16, Cornhill,

Sir, April 23rd, 1874.

I beg to acknowledge the receipt of your letter of the 22nd instant, in which you desire me to inform the Committee that the result of inquiries into casualties caused by explosion or fire in coal-laden vessels held by the Board of Trade is invariably the same, viz., that the officers of the ships are exonerated, that the Court recommends better ventilation; and as the Board of Trade have no reason to believe that the recommendations of the Courts have any effect in inducing owners to adopt a better system of ventilation, or render underwriters unwilling to insure vessels of this description, the Board of Trade have decided not to order inquiries in such cases in future.

The Committee will, no doubt, order me to circulate notice of the resolution of the Board of Trade and the reasons of it, as widely as possible. But, before any steps are taken with that object, will you allow me to ask you if the matter will not admit of a representation of the views of the Board of Trade, something as follow:

(I.) That, as the Courts appointed by the Board of Trade and their assessors acquit the officers of the ships of all blame for explosions, with which the offieers have nothing to do, but abstain from finding that the vessels wherein such explosions occur through the absence of proper ventilation are unseaworthy, the Board of Trade have come to a resolution to hold no more such inquiries.

(II.) That they are confirmed in this resolution not to hold inquiries because the owners of these ships are determined that their ships shall continue to go to sea in the unseaworthy condition, which the Board of Trade inquiries apparently ought to have found them to be in.

(III.) Because underwriters, who, at the time when risks are taken on these ships are altogether without means of ascertaining whether or not the ships are unseaworthy in the particular matter of due ventilation, continue to take risks.

I am, &c.

(Signed) J. A. W. Harper, Secretary.

The Assistant Secretary, Marine Department, Board of Trade.

Board of Trade to Lloyd's.

Board of Trade, Whitehall Gardens,

Sir, September 29th, 1874.

I am directed by the Board of Trade to request you to be so good as to move the Committee of Lloyd's to cause

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a table to be prepared for the Board of Trade of such coal-laden vessels as have been reported to them as lost or damaged through the spontaneous combustion of their cargo during the twelve months ending 30th June last.

I am to request that as far as possible the table should state the name, port, and tonnage of each vessel, her voyage, and whether steam or sailing, the date, place, and result of explosion, the number of lives lost, and whether the cargo was ventilated or not.

I am, &c.
(Signed) HENRY G. CALCRAFT.

The Secretary, Lloyd's.

LLOYD'S to BOARD OF TRADE.

SIR, Lloyd's, E.C., October 14th, 1874.

I AM directed by the Committee of Lloyd's in reply to your letter of the 29th September to forward to you the enclosed two copies of the return of casualties to coal-laden vessels by fire, prepared by the Committee so far as it lies within their power to ascertain the losses or damages requested in your communication.*

I am, &c.
(Signed) HENRY M. HOZIER,
Secretary.

The Assistant Secretary,
Marine Department, Board of Trade.

LLOYD'S to BOARD OF TRADE.

SIR, Lloyd's, November 5th, 1874.

WITH reference to my letter of the 14th October enclosing a return of coal-laden vessels reported in Lloyd's List as lost or damaged through fire during the twelve months ending 30th June 1874, I beg to enclose you a supplementary return showing the coal-laden vessels reported in Lloyd's List as lost or damaged through fire from 1st July to 31st October 1874.

I am, &c.
(Signed) HENRY M. HOZIER,
Secretary.

The Assistant Secretary,
Marine Department, Board of Trade, S.W.

P.S.—I also enclose a list of coal-laden vessels posted as missing from 1st July to 31st October 1874.

LLOYD'S to BOARD OF TRADE.

SIR, Lloyd's, November 7th, 1874.

I AM directed by the Committee of Lloyd's to inform you that the Committee have learned with regret that the Board of Trade has abandoned holding inquiries in the case of fire to coal-laden ships. By the return of coal-laden ships to which casualties are reported to have occurred according to Lloyd's List that I sent to you in my letter of yesterday's date, you will perceive that of late there appear to have been a great number of such casualties, and I am directed to draw your attention to this fact with the hope that you may be able to move the President of the Board of Trade to allow some inquiry to be made into the circumstances connected with the casualties by fire to coal-laden ships.

I am, &c.
(Signed) HENRY M. HOZIER,
Secretary.

The Assistant Secretary,
Marine Department, Board of Trade.

BOARD of TRADE to LLOYD'S.

Board of Trade, Whitehall Gardens,
SIR, December 1st, 1874.

WITH reference to your letter of the 7th instant, calling attention to the necessity for making inquiry into the circumstances connected with the casualties by fire to coal-laden ships, I am directed by the Board of Trade to state that in the year 1873 official inquiries were held into the cases of the steamers "Zeno" and "Berwick," and the barques "Herbert Graham" and "Minnie Graham" which had been lost through combustion of the cargo of coals.

In each of these cases the master was acquitted, and the Court suggested that means should be adopted for the proper ventilation of coal-laden vessels.

Looking therefore to the uniform result of the inquiries in these cases, the Board of Trade, before resuming them, would be glad to be informed what is the particular advantage which the Committee think is to be derived from them.

I am, &c.
(Signed) THOMAS GRAY.

The Secretary, Lloyd's.

LLOYD'S to BOARD of TRADE.

Lloyd's,
SIR, December 3rd, 1874.

I AM directed by the Committee of Lloyd's to acknowledge the receipt of your letter of the 1st December, and in reply to inform you that several causes of the frequent occurrence of fires of late in coal-laden ships have been suggested, such as the excess of ventilation, the short time that is allowed between the extraction of the coal from the pit, and its stowage on board ship, the increasing inferiority of coal, and consequent more frequent prevalence of iron pyrites, and that all these and other causes have been supposed to lead to the great risk of loss of life which is involved in the combustion or abandonment of coal-laden vessels. Under these circumstances it appears to the Committee that the object of the inquiry should be to illustrate facts, and to publish them for the information of the general public, with a view to the prevention of the great risk of loss of life which now appears to be involved in the coal trade, and which, according to the tables which I lately forwarded for your perusal, appears to be seriously on the increase.

I am, &c.
(Signed) HENRY M. HOZIER,
Secretary.

The Assistant-Secretary,
Marine Department, Board of Trade, S.W.

SALVAGE ASSOCIATION to BOARD of TRADE.

16, Cornhill, E.C.
SIR, December 21st, 1874.

ON Tuesday last I laid before the Committee of this Association a letter addressed to the Committee by Sir John Pirie & Co., extensive coal shippers on the subject of coal combustion in ships.

The Committee consider that letter and the whole subject so important that they have desired me to transmit the letter to you, and to express their hope that the suggestions of Sir John Pirie & Co. will receive the very careful attention of Her Majesty's Government.

The Committee are sensible that the subject is one of singular difficulty and extreme obscurity; but a commission of inquiry, composed of scientific and practical men, might possibly discover the causes of active combustion of coal in ships, and so arrive at some practical remedy.

I am, &c.
(Signed) J. A. W. HARPER,
Secretary.

The Assistant Secretary,
Marine Department, Board of Trade.

London,
GENTLEMEN, December 11th, 1874.

BEING largely interested in the trade, we beg to call your attention to the unusual number of instances lately reported (as per list herewith) of spontaneous combustion of coal laden on board vessels on their way to distant ports.

It is of the greatest importance to all concerned that—

1. The cause of such ignitions shall be investigated.
2. The best means be ascertained for preventing them, when possible, by ventilation or otherwise.
3. Steps be taken to discover the best mode of extinguishing fire when it does occur on board ship.

We take the liberty, therefore, of proposing that the Board of Trade be requested by you to undertake such an investigation, appointing qualified scientific experts to carry out a thorough inquiry.

The present plan of using water or scuttling ships (when practicable) appears to us a most wanton and destructive mode of proceeding, and surely some apparatus may be applied so as to extinguish fire by carbonic acid gas, where the hatches can be battened down.

We are, &c.
(Signed) JNO. PIRIE & Co.

The Salvage Association,
16, Cornhill, E.C.

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* The Returns enclosed in this and the subsequent letter will be found in an extended form, Appendix V., page 101.

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BOARD OF TRADE to SECRETARY, LLOYD'S.

Board of Trade, Whitehall Gardens,
December 23rd, 1874.

SIR,

I AM directed by the Board of Trade to acknowledge the receipt of your letter of the 3rd instant, in which you state that various causes have been suggested to account for the frequent fires on board coal-laden vessels, and that the Committee of Lloyd's think that the object of inquiries to be in future held by order of the Board of Trade should be to illustrate facts, and to publish them for the information of the general public, with a view to the prevention of the great risk of loss of life which now appears to be involved in the coal trade.

In reply I am to request that you will state to the Committee of Lloyd's that the Board of Trade have made many inquiries into cases of fire and explosion on board coal-laden vessels, and these inquiries have shown that the various causes enumerated in your letter are fruitful of great risk of loss of life on board coal-laden vessels. Copies of the reports of the three last inquiries are enclosed.

What remains to be done is to take warning by the facts proved at these inquiries, and to take such steps as may render coal-laden ships safe by better ventilation, by providing means for stifling flames, and by caution as to the description of coals shipped and their condition when shipped, and this involves primarily the interests and responsibility of owners and underwriters.

Some serious steps should be taken by those who own, manage, and insure these ships and their cargoes, and what the Board can properly do to assist such endeavours shall not be left undone.

They, however, are unable to see any use in holding inquiries which seem to lead to no practical result, and they rather wait to see that their report should receive some consideration and attention than propose to themselves a fruitless continuance of disregarded information.

The Board of Trade, however, will not fail to insure full investigation of any special cases brought to their notice likely to bring out any further facts.

I am to add that the Board of Trade learn that the Board of Underwriters in Boston have had their attention directed to the subject, and intend to frame rules showing under what conditions they are prepared for the future to undertake risks on coal-laden vessels.

I am, &c.
(Signed) THOMAS GRAY.

The Secretary, Lloyd's.

BOARD OF TRADE to SALVAGE ASSOCIATION.

Board of Trade, Whitehall Gardens,
December 31st, 1874.

SIR,

I AM directed by the Board of Trade to acknowledge the receipt of your letter of the 21st instant and its inclosure from Sir John Pirie & Co., suggesting, that a commission of inquiry should be instituted into the causes of spontaneous combustion on board coal-laden ships.

With reference thereto I am to inclose a copy of a recent letter (23rd December 1874—M. 16285) from this Board to the Committee for managing the affairs of Lloyd's on the same subject.

The Board of Trade will be glad to hear what action has been taken by owners and underwriters in consequence of the numerous reports after the official inquiries already instituted by this Board, what steps, if any, have been taken by shipowners, shippers, and underwriters themselves to ascertain the causes of explosions on board coal-laden ships, or to ensure the proper stowing and ventilating of coal cargoes on board ship, and, further, whether there is any guarantee that if the Board of Trade takes any steps in the direction indicated in your letter either by re-opening inquiries in the case of casualties to coal-laden ships, or otherwise, the result will receive attention or consideration on the part of underwriters, shippers, and shipowners.

I am, &c.
(Signed) THOMAS GRAY.

J. A. W. Harper, Esq.

SALVAGE ASSOCIATION to BOARD OF TRADE.

Coal-laden Ships.

16, Cornhill, E.C.
January 1st, 1875.

SIR,

I AM desired by the Committee of this Association to acknowledge with their thanks receipt of your letter of December 31st, 1874, enclosing a copy of a letter from you to the Committee of Lloyd's dated 23rd December 1874, M. 16285.

In reply to your letter to this Committee, the Committee consider that there is in their letter on the subject and in the accompanying letter from Messrs. John Pirie & Co., extensive coal shippers, some guarantee that if the Board of Trade should think proper to take any steps in the direction indicated in a letter of the Committee, that is, in the direction of a combined, scientific and practical, inquiry, the result of that inquiry will receive attention and consideration on the part of underwriters, shippers and shipowners.

With respect to your letter to Lloyd's Committee, they desire me to observe that the Committee were not aware that any inquiries, that is inquiries of the nature suggested by this Committee, viz., by scientific and practical men combined directed especially to the subject of the real causes of combustion of coals in ships, and possibly the means of avoiding them, had ever, up to the date of their letter, been held.

The Committee need not point out to you that an ordinary inquiry, conducted perhaps by a justice of the peace and two assessors, whose principal, if not exclusive function, and principal if not exclusive qualification for the office, are their knowledge of ships and navigation, is not an inquiry calculated to elucidate a subject so difficult and so obscure in itself, and rendered further obscure by the great conflict of opinion.

The Committee presume that these are not the inquiries which you allude to as having led to no practical result.

The Committee are afraid that the facts which you mention as having been proved at such inquiries are generally considered as only discussed, and the real facts remain too uncertain for it to be possible that the Committee should hope they will constitute the warning you desire.

If an investigation were held such as the Committee venture to suggest, one by men of high scientific attainments, and especially scientific acquaintance with coal in its nature and in all its applications of whom the name of more than one will immediately suggest itself to you, combined with persons practically acquainted with coals in the pit and in the ship's hold, the result might be to fix with a certainty, absolute or qualified, what the causes of this dangerous combustion of coals in ships are, and then this great advantage would be gained that the responsibilities would be fixed upon the proper person, and the clear knowledge of those responsibilities would be likely to operate to cure the mischief.

With respect to the projected combination of underwriters in Boston, to model their conditions of insurance to the dangers of combustion, the Committee beg to observe that underwriters are neither coal owners nor shipowners, and are very likely to be wholly unversed in subjects such as that of the combustion of coals, and that it is not improbable that the underwriters in Boston may be found to jump at conclusions which a more thorough knowledge of the subject might discover to be entirely a mistake. And on the whole subject of the intervention of underwriters, the Committee beg to point out that such a remedy is very much too circuitous, indirect, and uncertain to be worth considering on such a critical question as the combustion of coal in ships; and further that a combination of the comparatively few underwriting companies existing in Boston is probably an easy thing. In the underwriting community of London and especially Liverpool, a very difficult, if not an utterly impracticable one.

And as to merchants and shipowners providing a remedy the Committee beg to point out again that at present the facts are not ascertained with sufficient certainty and with sufficient authority to justify any expectation of an effectual remedy in those quarters.

I am, &c.
(Signed) J. A. W. HARPER,
Secretary.

The Assistant Secretary,
Marine Department,
Board of Trade.

BOARD OF TRADE to SECRETARY LLOYD'S.

Casualties.

Board of Trade, Whitehall Gardens,
January 14th, 1875.

SIR,

WITH reference to previous correspondence upon the subject of inquiries into cases of casualty by fire to coal-laden vessels, I am directed by the Board of Trade to state that the Salvage Association, who have also communicated with this Board upon the subject, have suggested

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that inquiries should be held into such cases by scientific and practical men combined, and directed especially to the subject of the real causes of combustion of coals in shipping, and possibly the means of avoiding them.

This suggests the appointment of a Scientific Commission, and the Board of Trade would be glad to learn whether this arrangement would meet the views of your Committee.

I am, &c.

(Signed) HENRY G. CALCRAFT.

The Secretary, Lloyd's.

LLOYD'S to BOARD OF TRADE.

SIR, Lloyd's, January 20th, 1875.

I AM directed by the Committee of Lloyd's to acknowledge the receipt of your letter of the 14th January, and to inform you that the Committee consider that an inquiry should be held into cases of casualty by fire to coal-laden vessels by scientific and practical men combined.

I am, &c.

(Signed) HENRY M. HOZIER,
Secretary.

APPENDIX II.

STATUTORY INQUIRIES held by BOARD OF TRADE, and Reports of other Cases received from that Department.

REPORTS of STATUTORY INQUIRIES held under the BOARD OF TRADE into cases of SPONTANEOUS COMBUSTION in COAL-LADEN VESSELS, from 1868 to 1874, inclusive.

"CATTOFIELD" Barque, of Aberdeen, of 450 tons register.

Port Elizabeth,
17th September 1868.

Inquiry into the circumstances connected wtth the loss of the barque "Cattofield," destroyed by fire near the island of Tristan d'Acunha, and abandoned on the 25th August 1868.

Appeared WILLIAM ROBERTSON, who, being duly sworn, deposes:—

I was chief officer of the barque "Cattofield," bound from Leith to Penang, laden with coals. We sailed from Leith on the 22nd June last. Everything went on right until the 24th August, when just after dinner we observed smoke coming out of the after cabin, which I reported to the captain, who said he could hardly believe such, and that I must go and examine. I did so, and found the smoke ascending through the after hatch. I took the hatch off, and found the coals very heated. I reported such to the captain, who examined it himself. The captain held a consultation as to what was best to be done, and all were of opinion there was no immediate danger, and so we secured all the hatches and bore away for the nearest land, which was Tristan d'Acunha. By 4 or 5 o'clock that same night the smoke increased so much as to prevent the men going down the forecastle. We made preparations to leave the ship in the event of the fire breaking out before morning. Early the next morning an explosion took place, blowing off the fore hatches, previous to which the decks had become so hot as to melt the pitch. About two hours afterwards another explosion took place, blowing off the lazarette hatches. In the cabin the smoke now became so dense that we were unable to go below. The vessel was still sailing towards the island, but no land visible from the masthead. We then put some clothing in the longboat and some bread and water, ready to leave at a moment's notice. We did not try to extinguish the fire by pouring water down, because the smoke was issuing so dense that we could not reach the hatches. At 10 a.m. that morning, the 25th, we sighted a vessel and made signals of distress and steered towards her, and she bore down to us and lowered a boat and sent us assistance. We put some more clothing in that boat, lowered our own, and some of the crew left the ship. The captain, the carpenter, myself, and one or two others remained on board our vessel; but the heat and smoke became so bad that we were compelled to abandon the vessel, and just as we were leaving another explosion took place, blowing off the main hatches, the captain being the last man to leave the ship. It was the "Glenlyon," bound to Bombay, that rendered us assistance. The carpenter scuttled the vessel before leaving her. We all went on board the "Glenlyon" and sailed her course, and on the 10th we were put on board the barque "Aletheia" off Cape St. Francis, and landed in Algoa Bay on the 13th instant. The vessel was still visible when we abandoned her, but dense smoke issuing from all parts. Our hatches were properly battened down fore and aft. I considered the fire had gained too much hold of the cargo when we first discovered it to enable us to extinguish it by pouring water on it. The cargo seemed to be generally on fire. The ship was not supplied with a fire engine. I was not present when the cargo was shipped. The ship had not strained at all. The object of scuttling the ship was to prevent collisions with other vessels. She was scuttled from the outside.

Cross-examined.

I first discovered the smoke issuing from the after cabin, and the fore hatch blew off first. I thought the whole cargo was on fire and so general that we did not know where to commence throwing water down. No one could have worked in the hold, from the dense heat, smoke, and sulphur that arose. We battened the hatches down with a view of smothering the fire by preventing access of the air. I should think we were 250 miles from land. I have never heard of coal fires being extinguished. We found it impossible to remain any longer on board. We transferred some of the clothing we had placed in our longboat to that of the "Glenlyon."

WILLIAM ROBERTSON,
Chief Officer.

Before us, the 18th September 1868,
JOHN CAMPBELL, R.M.,
F. S. READ, Assessor.

HENRY JOHN BASTARD, duly sworn, deposes:

I was second officer on board the barque "Cattofield," and remember the chief officer reporting smoke was issuing from the after cabin. I went with him to examine it, when we found smoke coming up the main and after hatches. We took the main hatch off, examined the coals, which we found very hot, and smoke coming up the ventilators through the main hatchway. We thereupon battened the hatches down fore and aft, and steered for the island Tristan d'Acunha. About 8 o'clock that same night the crew came aft and reported the smoke to be so dense that they could not stop in the forecastle. We got the longboat ready for launching and put some water and provisions in it in case the fire should break out and be compelled to abandon the vessel. An explosion took place the following morning, blowing off the fore hatches. The decks had become very hot. Some time after another explosion took place, blowing off the lazarette hatches in the cabin. The smoke increased, but no flames issued. We sighted a sail, which bore down to us and sent us assistance. The smoke and heat had increased so much that we could remain no longer on board, and we all left the ship and went on board the other vessel, being the "Glenlyon." Before leaving our vessel the carpenter scuttled her. An explosion blew off the main hatch just as we were leaving her. On first discovering the fire we had no hopes of extinguishing it. I saw the cargo shipped. The coals were perfectly dry, the hatches were properly battened down, and the ship was tight. From what I could judge the fire seemed to be general.

HENRY JOHN BASTARD.

Before us, this 18th September 1868,
JOHN CAMPBELL, R.M.,
F. S. READ, Assessor.

JOHN MASSON, duly sworn, deposes:

I was carpenter of the barque "Cattofield," and remembered when the vessel was first discovered on fire, on the 24th August. I examined the coals, and found them very heated; smoke was issuing from them. We battened down the hatches. The smoke increased to such an extent that the men could not remain in the forecastle. The following morning, between 5 and 6 o'clock, an explosion took place, blowing off the fore hatch. Some time after another took place, blowing off the lazarette hatches. The smoke and

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heat had so much increased that we could not go below. During the day we sighted a vessel, and sent us assistance on board. The smoke had become so dense and the heat so great that we could no longer remain on board, and we abandoned the vessel and went on board the other, which proved to be the "Glenlyon." Just as we were leaving the ship another explosion took place, blowing off the main hatch. After we got into the boat I scuttled the vessel by cutting a hole with an adze at midships, just above the copper line. We then sailed in the "Glenlyon." I think it was then about 3 o'clock in the afternoon. I saw the vessel about 5 o'clock. There was smoke issuing from all parts, but no flames were visible. The ship made no water; she was quite tight. I did not see the cargo shipped.

JOHN MASSON,
Carpenter.

Before us, this 18th September 1868,
JOHN CAMPBELL, R.M.,
F. S. READ, Assessor.

Statement of SAMUEL E. JANE, late master of the barque "Cattofield," of 450 tons, burnt at sea.

On the 24th June 1868 I sailed in command of the barque "Cattofield," of Aberdeen, from Leith, laden with a cargo of coals at that port, and bound for Penang. On the following day, 25th June, anchored in Aberdeen Bay to land a sick man. At 9 p.m. of same day got under weigh and proceeded on the voyage.

Nothing of import occurred until the 24th August, when the ship had reached the latitude of 34° 24′ S., longitude 15° 40′ W.

About 1 p.m. on that day smoke was observed issuing from the after cabins. I immediately examined the hold, and found smoke ascending up through the coals and ventilators, and the heat very great a little below the surface. The coals had evidently ignited. I then had all the hatches closed down to prevent flame from bursting out, and bore away for the islands of Tristan d'Acunha, distant about 250 miles in S.S.E. direction.

At 9 p.m. the smoke became so dense it was impossible to remain below, the fire increasing rapidly and smoke issuing from every aperture. Fearing it would be impossible to reach the islands, at midnight got the boats ready for launching, placing a little provisions and water in each, in order to leave the ship at any moment, should the flames break out.

At daylight on the 25th, nothing was visible from the mastheads; we continued running towards the islands, the wind blowing strong from the N.E. with a rough sea. About this time an explosion took place, blowing off the forward hatch.

About 9 a.m. a sail was descried ahead from the main topgallant yard. I immediately steered for her with distress signals flying, and about noon we were near enough to exchange signals. She proved to be the ship "Glenlyon," of Quebec, from Liverpool, bound to Bombay, commanded by Captain McIntyre, who on learning our condition at once hove to, and sent a boat alongside to render us any assistance needed.

The wind freshening and the sea rising, no time was to be lost in leaving the burning ship, it being now utterly impossible to get below.

We then launched the boats, and putting what clothing could be got into them, abandoned the ill-fated "Cattofield" about 3 p.m. on the 25th August last, scuttling her before doing so.

Previously to the last boat leaving the ship another explosion took place, blowing off the main hatches. The smoke rushed up in clouds. I immediately jumped into the boat and shoved off. We were very kindly received by Captain McIntyre, of the "Glenlyon," and every attention was paid to our comfort while on board his ship. When the "Cattofield" was last seen, smoke was pouring in volumes from every hatchway and skylights, and she could not possibly last for many hours.

And I must here express my gratitude to Captain McIntyre, who, under Providence, was the means of rescuing us from the horrors of a burning ship.

We remained on board the "Glenlyon" until the 10th September, when a part of the crew were transferred to the "Aletheia," bound for this port; the weather becoming bad, the remainder of the crew remained on board the "Glenlyon" until the following morning, when they were all transferred to the "Aletheia," and were safely landed here on Monday the 14th instant, all in good health, viz., myself and 15 men.

I cannot let the opportunity pass without thanking Captain Daniels, of the "Aletheia," on behalf of myself and crew, for the promptness with which he consented to receive us on board his ship (already full with passengers), and the trouble taken by him and uniform kindness evinced towards us while on board.

S. E. JANE,
late Master of the "Cattofield."

Port Elizabeth,
17th September 1868.

Judgment of the Court.

The Court is of opinion that the abandonment of the barque "Cattofield" was not caused by the wrongful act or default of the captain, but the cause of her loss was spontaneous ignition of her cargo of coals.

JOHN CAMPBELL, Resident Magistrate
F. S. READ, Assessor.

"PERSIA," * of Glasgow, a wooden ship of 1,289 tons register, four years old, classed A 1 for seven years.

The Mauritius Marine Board met on Friday, 27th November 1868, for the purpose of inquiring into the loss by fire of the ship "Persia," of the burthen of 1,289 tons, James Clark, master, which took place in lat. 40 South, long. 21 East, or thereabouts, on the 2nd instant.

Members of the Board present:

D. WALES, Harbour Master and President.
A. W. BARCLAY, Surveyor and Merchant.
J. COWIN, Surveyor.

Appeared before the Board for examination, and were duly sworn:

James Clark, master; Peter Hutchinson, mate; Hugh Conville, 2nd mate; together with several of the crew of the late ship "Persia."

The master and the two mates were examined on oath; their evidence was clear and precise. It was not considered necessary to call in any of the crew.

It appeared from the evidence, and also from the log book, that the "Persia" sailed from Greenock on the 31st August 1868, laden with coals and bound to Bombay; she was tight and staunch when she left, and continued so to the time of her loss. The voyage was prosecuted successfully till the 1st of November, when gas and smoke were observed rising from the coals about the midship part of the vessel, and on examination it was evident from the heated temperature that combustion was going on. This was met and combated by every available means; water was freely poured over the part that appeared most heated, the deck above being scuttled for that purpose; the force pump was worked by a portion of the crew and directed to the same spot. The water in the well soon increased to 3 feet, and the vessel's pumps were set on and the water as it rose conducted on the burning coal. Coals were dug out and thrown overboard in the hope of getting at the real seat of the fire, and a party of men remained at that work till driven on deck by the rapidly increasing volume of gas and smoke. The "Black Watch" hove in sight at this critical time; it was now evening; she laid by the "Persia" during the night, and on the morning of the 2nd November, the captain, officers, and crew abandoned the ill-fated vessel, from every hatchway of which columns of dark, black smoke, with occasional flashes of flame, were issuing. Mr. Kerruish, the master of the "Black Watch," fully confirmed this part of the statement.

There was in fact so little time to spare that hardly any of the effects of the crew were brought away, and the master and mates lost everything, certificates included. There is no doubt in the opinion of the Board that every possible exertion was made to save vessel and cargo.

In reference to this loss the board would remark that in their opinion the burning of coal-laden vessels demands the serious investigation of scientific men. These fearful accidents are increasing in frequency, and spontaneous combustion is hardly a satisfactory conclusion to arrive at. Why is there spontaneous combustion? Why does one ship burn from that cause, and dozens of others laden from the same pit, at nearly the same time, arrive safely at their destination? Is ventilation of the coal advisable or dangerous? Ought hatches to be kept on or off? Could not inflammable gases be pumped out of a ship's hold? Is there not a method of creating gases in an inexpensive manner on board ship that would smother and extinguish any amount of fire in a vessel's hold? Such measures are spoken of commonly enough but are apparently never carried into practice. Three large coal-laden vessels, the "Pernix," "Volante," and the "Persia" have been burnt at sea, and their crews arrived in this colony during the last year. What destruction of property? What risk to

* For the correspondence, arising out of this case, between the Board of Trade and the Local Marine Boards in the United Kingdom, see page 25.

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life? What privation and suffering do these burnings entail? At this moment there is a valuable vessel in this port, coal-laden, which narrowly escaped the same fate as the "Persia," the coals having been smouldering many days before they could be extinguished.

The Board submit these remarks for consideration, and hope that the very important subject they refer to may be thought worthy the attention of competent persons. Certainly any one who will point out the way in which coals may be conveyed to distant ports without greater risk than the generality of cargoes will have deserved well of owners, sailors, underwriters, and last not least, of humanity.

D. WALES,
Harbour Master, President.
A. W. BARCLAY,
Marine Surveyor.
JOHN COWIN,
Marine Surveyor.

"L'AGOUHANNA," of Glasgow, a Quebec-built ship of 1,103 tons register.

Bombay Fort Police Court,
Tuesday, 16th February, 1869.

Pursuant to the Government notification, Marine Department, dated the 10th instant, appointing John Connon, Esquire, Acting Chief Magistrate of Police, and Lieutenant G. O'Brien Carew, late Indian Navy, to conduct an investigation into the circumstances connected with the loss by fire of the ship "L'Agouhanna" on Tuesday, the 2nd instant, about 30 miles west of Hurnee, and 100 miles south-west of Bombay, the Court assemble this day at half-past 2 o'clock p.m. for the purpose stated.

MR. HEARN, solicitor to Government, appears to watch the case on behalf of Government.

WILLIAM KENNEDY sworn; examined by MR. HEARN.

I was captain of the ship "L'Agouhanna." I hold a master's certificate from the Board of Trade, No. 28,697, dated 14 July 1863.

She was Quebec-built and 1,103 tons burthen. We were bound from Liverpool for Bombay with a cargo of coal. The coal was shipped in Birkenhead Docks. It was called West Hartley coal or North Wales coal. It came by railway as far as I could tell direct from the pits. We came out of the docks on the 30th of September last and started direct on the voyage. Everything went right up to the 4th of February. On the 2nd of this month my second officer who has been acting for the chief officer, Mr. McKee, came and reported to me, about 7 o'clock in the evening, that there was a smell of something like naphtha or coal tar, and that the paint was a little stained just by the forehatch. I went to investigate this, but I could find no greater heat than I had noticed during the rest of the voyage. There was a little steam, but nothing more than I noticed three days after we left Liverpool. I sent the second officer down below the same evening. He reported that there was no more heat below than there was on the forehatch, next morning a little after 4 o'clock, when I went on deck, the boatswain came and said he thought there was fire in the ship. I sent for the carpenter and sent him below. He came up in about ten minutes and reported the ship was on fire, and that the smoke was coming up strong by the stanchions, and said there was every appearance of fire amongst the coal. I immediately ordered the force pump to be got out and applied water to every available place in the hold. We continued throwing water with buckets as well as the pumps till 8 p.m. The smoke was at that time so strong that the men could not stop below for more than a few minutes at a time. The smoke was coming up through all the hatches and through the ventilators besides; of these we had one upright down each hatch. There was an upright ventilator connected with others that went fore and aft both above and below the beam. At this time we were in 30 fathoms water and about 30 miles from the land, as far as I can judge south-west of Hurnee. The wind was about north-north-west. The ship was under sail, making the best we could for the land, and so we continued until 4 o'clock next morning, the weather being at that time very fine. At 4 o'clock on Wednesday morning, 3rd February, I called the hands aft and told them my opinion about the ship being on fire, and ordered the boats to be got ready and provisioned in order to be prepared for the worst. That was all done by daylight; water was still being thrown below by the hose. The men had been obliged to leave the forecastle at 3 o'clock. In the course of the night I tacked the ship to the westward fearing to get too near the land; at 3 o'clock I tacked again to the eastward to get nearer the land. About 7 or 8 o'clock, as near as I can remember, the smoke became so strong we could not stop on deck and we had to take to the boats and about a quarter of an hour after that we saw the flames coming up through the after hatch, the cabin skylight, and the stern windows. About an hour after this, when we were pulling for the land, the main and mizzen masts fell, and between 11 and 12 the foremast fell. I reached land with my boat about 10 at night. One or two of the other boats had reached from 4 to 7. We made out the glare of the burning ship until about 12, when it disappeared.

All the crew came safe to land. I saved my chronometer, part of my clothing, and sextant. I lost all my charts and nautical books with the rest of my library,

This is the ship's third voyage to Bombay with coal. I never experienced an alarm of fire before. I noticed no particular difference between the coal on this occasion; in fact there was less steam on this occasion from the coal than there was from the coal on the first voyage.

I can only attribute the fire to some inflammable quality in the coal, and I think the fire first took place in the bottom of the ship. According to my experience coal is always shipped or stated to be shipped direct from the pits, and according to my experience coal ships now-a-days catch fire more frequently that they formerly used to do.

By the Court:

We were about nine days in loading, no fresh water got into the cargo then, nor afterwards. It was showery when we were loading, but we stopped loading during the showers. It was about eight and twenty hours when we took to the boats after the fire was discovered. I always thought we should be able to drown out the fire till we were compelled to take to the boats. We could not get the ship nearer the land because there was no wind from midnight of Tuesday until the time we left the ship with the boats. I cannot say whether the coal on this occasion was from the same pit as the coal we carried on previous occasions.

In this ship or any other ship I know of laden with coals, if a fire were to break out in the bottom of the hold, there are no means of immediately finding it out.

WILLIAM KENNEDY.

Taken on oath before us,
JOHN CONNON,
Acting Chief Magistrate of Police,
G. O'B. CAREW,
Lieutenant, late Indian Navy.

ROBERT MCKEE sworn; examined by MR. HEARN.

I was second officer of the ship "L'Agouhanna." I have been doing duty as chief officer for the last two months and half, during the illness of the chief officer. I hold a certificate from the Board of Trade as second officer. I did not the see coal taken on board. I only joined the ship on the 28th September. There was no appearance of fire until the 2nd February, on which day, at 6 o'clock in the evening, I called the captain's attention to a smell. I did not think it was fire; I thought it might be a little extra steam. The captain at once sent the carpenter below and I went down myself. I discovered no extra heat. I first discovered the ship was on fire at 4 o'clock on Tuesday morning, and we continued pumping and throwing water into the hold all that day and night till about half-past 3 o'clock on Wednesday morning. I thought all Tuesday that we should get the fire under. On Tuesday night, between 7 and 8, the smoke became so suffocating that we could not stay below. I went down the main hatch about every ten minutes and shifted the hose on to the hottest place.

The hands were pumping and carrying water in buckets all through the night. They were driven from the forecastle about half-past 3, and we then found it was a hopeless case. The boats were then all got ready, watered and provisioned, and dropped astern, and we were obliged to take to them about 8 o'clock. The wind was about north-north-west on Tuesday night. It was fresh during part of the night. It fell light about 12 o'clock, I reached the shore about half past 6 o'clock on Wednesday night. I could see the glare of the fire at that time. The ship's hands could not have worked harder, and nothing more have been done than was done to put out the fire.

ROBERT MCKEE.

Taken on oath before us,
JOHN CONNON,
Acting Chief Magistrate of Police,
G. O'B. CAREW,
Lieutenant, late Indian Navy.

Adjourned.

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Bombay Fort Police Court,
Friday, 19th February 1869.

MR. HEARN appears to watch the case on behalf of Government.

ALEXANDER SMITH sworn; examined by Mr. HEARN.

I am the carpenter of the "L'Agouhanna." This is my third voyage in her. I saw her take in coal at Liverpool. I was by her all the time. It was in the month of September. It was not much wet. There were summer showers. The coals were quite dry when they were shipped. They came by railway. The coal was in good order. In my opinion no water, either salt or fresh, could have got to the coals after they were shipped, from the precautions I took. The ship is very tight; she did not make an inch of water in 24 hours. The first thing that came to my notice on Monday, the 2nd February, was that the paint at the fore hatch was discoloured, but I thought there was nothing unusual in this, and did not think it was necessary to to mention it to the captain. Next morning at 5 a.m., the captain sent me below to see if there was any heat among the coals. I went below, half way between the fore and main hatch by the stanchions. I saw the smoke coming up by the stanchions. I moved a quantity of coal, and noticed the smoke coming up much stronger, and there was a smell like coal-tar or naphtha. This was about the centre of the ship. I tried the same experiment towards the sides and forward, but there was no heat whatever. I went on deck again and told the captain the coal was on fire. He got a force-pump to work at once among the coals. It was a good and powerful pump. The pumping went on from Tuesday morning until we left the ship on Wednesday. The fire got worse, and the men could not stop below. They could only go down for a minute to shift the hose. The fire spread aft first, about 6 o'clock on Tuesday evening. About 5 o'clock on Wednesday morning we found it was a hopeless case. The men worked as hard as they could, and everyone did his best. The captain then gave orders to get the boats ready, and to have them provisioned. About 8 or 9 o'clock we took to the boats. The fire was actually blazing before we left the ship. The weather was fine on Tuesday, with a light breeze, and the ship was going slowly through the water. At midnight it fell calm. I cannot form any opinion as to how long the coal had been on fire. It might have been smouldering for a long time. I was never in a coal ship before, when the coal took fire. I cannot give any opinion as to the origin of the fire.

By the Court:

We had no naphtha or coal-tar on board; we had no cargo except coal.

ALEXANDER SMITH.

Taken on oath before us,
JOHN CONNON,
Acting Chief Magistrate of Police,
G. O'B. CAREW,
Lieutenant, late Indian Navy.

ISAAC NEWTON sworn; examined by Mr. HEARN.

I was boatswain on board the "L'Agouhanna." I saw all the coal shipped at Birkenhead. It was dry weather all the time we were taking in the coal. I noticed nothing unusual about the coal until Monday morning, the 2nd February. I thought there was more smell or dry heat. I had noticed a dry heat for several days, and not so much steam as on former occasions. On Tuesday morning about 4 o'clock I told the captain I thought there was more smoke coming up than there was yesterday. Upon this the captain told me to take the watch below and examine the coal, which I did as far as I could. I found the coals very hot, and a kind of vapoury smoke coming through. I went up and reported this, and the captain ordered the hose to be got out, and we kept playing water on the coals all day and all night. The fire continued to get worse and stronger, notwithstanding that everyone was doing his uttermost to get the fire under. On Wednesday morning the ship was too hot to hold us any longer, and we took to the boats. I reached the shore about sundown. I saw the main and mizzen masts fall soon after we left. I know of nothing inflammable on board except the coal.

ISAAC NEWTON.

Taken on oath before us,
JOHN CONNON,
Acting Chief Magistrate of Police,
G. O'B. CAREW,
Lieutenant, late Indian Navy.

Decision of the Court.

Bombay Fort Police Court,
Wednesday, 3rd March 1869.

Pursuant to the Government notification, Marine Department, dated the 10th February last, appointing John Connon, Esquire, Acting Chief Magistrate of Police, and Lieutenant G. O'Brien Carew, late Indian Navy, to conduct an investigation into the circumstances connected with the loss by fire of the ship "L'Agouhanna" on Wednesday the 3rd idem, about 30 miles west of Hurnee, and 100 miles south-west of Bombay, the court assembled on the days mentioned in the proceedings for the purpose stated.

From the evidence taken before us with regard to the destruction of the "L'Agouhanna," from Birkenhead, when approaching the port of Bombay, by fire, on the 3rd February last, we have arrived at the conclusion that spontaneous combustion in a cargo of coals was the cause of this accident.

It appears also from the evidence that the weather was showery, while the coals were being taken on board in the latter end of September last, or when they were conveyed from the pits, and this may perhaps have been the primary cause of the coals subsequently taking fire.

The captain in his evidence says all went well till the 1st February; on the next day, however, there was indication of fire among the coals, and the second mate was sent below to examine the state of the cargo. The next morning (3rd February), the boatswain expressed an opinion that there was fire in the ship's hold, and on the carpenter being sent for, he (after 10 minutes examination) reported there was fire among the coals, and at 8 p.m. of the same day the smoke was so strong that the men could not remain below more than a few minutes at a time.

On that day the captain called the crew aft and informed them that it was necessary to be prepared for the worst, and gave orders for the boats to be lowered and provisioned. On the following morning all hope of saving the ship being at an end, the captain and crew left in the ship's boats in good order and discipline, reaching the shore at Hurnee in the course of the same day. The ship seems to have gone down very soon after being thus abandoned.

We are of opinion under these circumstances that the ship should at once have been headed for the shore (at that time 30 miles off), where she might have been bilged without causing her total destruction; water would by that means have been admitted in at the seat of the fire, and with assistance obtained from the shore the bulk of the cargo as well as the ship might have been saved, as the captain believes (and we think correctly) that the seat of the fire was in the lowest portion of the cargo.

We are therefore of opinion that the captain acted injudiciously in standing to the westward, even if he did so for a short time, only with a view to the chance of meeting passing vessels and thus obtaining assistance.

The ship's log shows that fresh and moderate breezes prevailed, and there is no mention of calms during the time alluded to, the wind being north-north-west, and the port of Hurnee bearing about north-east, so that on a taut bowline and flood tide that port could have been made and the distance accomplished in eight hours, supposing the ship not to be making more than four knots an hour.

When the fire had got the upper hand and the captain saw that it was beyond the control of water applied, he should, we think, have adopted a plan universally followed by the chimney sweeps in England, by which (in case of a chimney being on fire) they exclude all air and smother the fire out by its own smoke.

It moreover appears from the evidence that there was an elaborate system of ventilation through the cargo. This ventilation, we are of opinion, should have been closed when it was discovered that the fire could not be controlled, and the excess of smoke mentioned by the captain and others might have smothered the flame, or at least given them ample time to have reached the shore.

In making these remarks with regard to what appear to us to be omissions on the part of the captain of the "L'Agouhanna," we fully recognise that he acted promptly and to the best of his judgment under the circumstances, and that every exertion was most creditably made on the part of both officers and crew, to carry out his instructions; nevertheless we conceive that he was wanting in resource in failing to adopt the precautions afore mentioned, although we are satisfied that according to his own conviction he made every effort to save the ship.

In connexion with this inquiry we would respectfully notice the frequent destruction by fire of coal-laden ships. A great number of such vessels have been destroyed by the coals taking fire within the last year or two.

During the last twelve months five vessels (the names of which are given in the margin) laden with coals have been discovered on fire in the port of Bombay, as reported by the master attendant of this port, and a number of others have been burnt on their outward voyage to India. It is, we would respectfully submit, a matter of great importance that means to detect any tendency to fire on board these ships, and of promptly meeting it when it exists, should be adopted with the least possible delay.

"Bell Isle,' one year ago. "H. E. Richardson," "Royal Albert," "Glenlyon," "Hannah Law," within the last six months.

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In view to the adoption of such measures we offer for the consideration of Government and others interested the following suggestion:—

In the case of all ships laden with coal a cylinder of iron, three inches in diameter perforated its whole length and reaching down to the bottom of the cargo, should be placed in the centre of each hatchway, a rod of wood to fit easy being introduced to prevent the coal dust filling it through the holes while loading; when the loading is completed the wooden rod should be replaced with an inch iron one of the same length; at short intervals of time these should be carefully examined; to render such examination easy an eye should be formed at the head of the iron rod, to which can be attached a whip from aloft, and the rods drawn and examined in a few minutes; even while in the act of withdrawing the hand can examine them, and having done so to within a foot of the end they can be again lowered.

Should the rod be considered not sufficiently sensitive to detect through the cylinder a slight increase of heat, a thermometer lowered by a line could be used, and it should also be used occasionally to ascertain the mean heat; any great increase would give the necessary warning.

In the event of fire the hose of the pumps can be introduced into the cylinders and water thrown to the bottom of the cargo, and disseminated by means of the holes to all parts of it.

With these means there would be little or no danger of fire getting the upper hand, as the only question on the occurrence of fire would be a sufficient supply of water, and with good force pumps that could be easily obtained.

We do not consider that the captain deserves any punishment, beyond the slight censure implied in the foregoing finding; and the officers and crew of the ship seem to have behaved well throughout.

JOHN CONNON,
Acting Chief Magistrate of Police.
G. O'B. CAREW,
Lieutenant, late Indian Navy.

Confirmed,
W. R. S. FITZGERALD,
Bombay Fort Police Court,
3rd March 1869.

"COMMODORE PERRY," of Newcastle, wooden vessel of 1,978 tons register, 14 years old, classed at American Lloyds A1½ for 3 years in January 1869.

Bombay Fort Police Court,
Monday, 6th September 1869.

Pursuant to the Government notification, Marine Department, dated the 1st instant, appointing John Connon, Esq., Senior Magistrate of Police, and Lieutenant G. O'Brien Carew, Indian Navy, to conduct an investigation into the circumstances connected with the loss by fire of the ship "Commodore Perry" in the Bombay Harbour on the night of the 28th August last, the court assemble this day at half-past 2 o'clock, for the purpose stated.

Mr. HEARN, solicitor to Government, appears to watch the case on behalf of Government.

THOMAS BLACK sworn; examined by Mr. HEARN.

I was the master of the ship "Commodore Perry." I have received a copy of the report on which this investigation is ordered. The "Commodore Perry" was ship-rigged, and a wooden ship 1,978 tons register; she belonged to Messrs. Thompson and Harper, of Newcastle-on-Tyne. I am not certain, but I think she was 14 years old; she was classed American Lloyds A1½ for three years in January last. I was on a voyage from Newcastle to Point de Galle for orders, with a cargo of coals. We had 2,560 tons of coal on board. It was Davidson's West Hartley coal. I saw part of the coal put on board, but not the whole. Part was shipped by wagons and about 250 tons out of lighters, from about 2nd February to 23rd March last. This is the second voyage I have taken her with coals. The coals were loaded dry. The ship had three decks. The lower hold was nearly full, the first deck two thirds, and the next deck a little over one third. The coal was stacked. Between the coal and the decks there was a current of air above and on the sides of the coal. Besides this the coal was ventilated by the fore and after hatches. A ventilator about four feet square ran from the poop down to the lower hold. I left Newcastle on the 8th March and arrived at Galle on the 7th July last; but having to put out again on account of the current, I did not get back again till 23rd of the same month, and left the following day for Bombay. On the 25th August a report was made to me that there was a large quantity of steam in the fore hatchway. I could not make out what it was at first, but on Friday, the 27th, I made out that the ship was on fire. There was a great deal of smoke in the latter part of the afternoon of that day. We made Kennery Light at dusk on Saturday evening the 28th. The pilot came on board about 9 p.m., and shortly afterwards there was an explosion which blew the fore hatches up, killing or suffocating the steward. The ship was immediately anchored. There was no flame visible at this time. The smoke was nearly all coming out of the fore hatch. The cabin was filled with smoke. I got the boats out as speedily as possible, being afraid that the ship might blow up in the main hatchway. After I got the boats out I went on shore for assistance. I first went on board Her Majesty's overland transport "Euphrates." I gave orders to the chief officer what should be done during my absence. I got back to the ship at about a quarter-past 5. She was then on Karanja shoal, she was a little below her loaded mark; tide ebbing at the time. She was burning very much forward at that time. Two water boats at that time were playing on her. They continued playing on her for the most part of that day. I went on shore about 6 o'clock to procure lighters to save the ship's stores. I went back towards the ship at half-past 5 in the afternoon, and found every one had left the ship. I returned to the shore in the Anchor bay. I gave up all idea of getting the fire under. The ship continued to burn from that time till she was consumed. I have been back to her three times. The second time I saw she was burnt down to the level of midships and below the loading mark at either end. I attribute the fire to spontaneous combustion of the coal. I can form no opinion why this cargo of coal caught fire while the other did not. I should have thought the other cargo of coal was more likely to take fire, as I am generally suspicious of Welsh coals. I have had a great deal of experience of coals, and as regards this cargo it was shipped under unusually favourable circumstances. It was fine weather, and the coal was shipped very dry. I produce the certificate I hold from the Board of Trade as Master, dated 4th March 1852, and No. 3,632.

By the Court.

We had rain several times on the voyage. The hatches were ordered to be put on whenever rain came. The ship did not make much water during the voyage; she was usually tight; she made more water just before we reached Bombay in two hours than she had previously done in 12 hours. I attribute this to the burning of the ship. I think the fire must have been in the lower 'tween decks, between the main and fore hatch. I left my ship for the purpose of obtaining assistance. I considered the ship was safe, as she was then at anchor, and therefore left myself in order to obtain assistance as speedily as possible. I have not heard of ventilator tubes being put through the cargo at different times in order to ascertain the heat. I never heard of that system prevailing in the Royal Navy. Some people think ventilators are of no use. I cannot give any opinion on this point myself, not having tried ventilators. I do not think the ship was fully insured. I know nothing about the cargo.

THOMAS BLACK.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police.
G. O'B. CAREW,
Lieutenant, late Indian Navy.

WILLIAM WRIGHT SINCLAIR sworn; examined by Mr. HEARN.

I was chief officer of the "Commodore Perry." I hold a master's certificate from the Board of Trade, and also a master's certificate from the Bombay Government; the Bombay certificate is dated June 1860, and the English certificate, 14th February 1862. The first time we saw any steam coming up was on the 25th August. On that day, as usual, I was up and down the hold two or three times. I did not notice any particular difference in the coals on that day; on the next day they were a little warm towards midships, and I fancy the fire must have broken out rather forward of the main hatch. Smoke was first visible on the 26th. I could not see any particular spot where it was coming from. The coal was quite dry. I saw the best part of the coals laden. They were very dry. The only opinion I can form as to the cause of this fire is that it must have originated from spontaneous combustion.

W. W. SINCLAIR.

JOHN CONNON,
Senior Chief Magistrate of Police.
G. O'B. CAREW,
Lieutenant, late Indian Navy.

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The other witnesses summoned in this inquiry are asked if they have anything to say to the court with regard to the destruction of the "Commodore Perry" by fire, and they reply that they are unable to say how the fire occurred.

The court adjourn until Monday next, the 13th instant, at half-past 2 p.m., to consider their decision.

JOHN CONNON,
Senior Magistrate of Police.
G. O'B. CAREW,
late Indian Navy.

Decision of the Court.

Bombay Fort Police Court,
Monday, 13th September 1869.

Pursuant to the Government notification, dated the 1st instant, appointing us to conduct an investigation into the circumstances connected with the loss by fire of the British ship "Commodore Perry" in the Bombay Harbour, on the night of the 28th August last, we beg to report that the court met for this purpose on Monday the 6th instant.

From the evidence before us it appears the—

"Commodore Perry" was a wooden ship, and was 1,978 tons register. She was 14 years old; but the captain, Mr. Black, states she was classed in January last American Lloyd A1½ for three years. She left Newcastle in March last for Point de Galle, and was loaded with 2,560 tons of West Hartley coal.

Nothing particular appears to have occurred during the voyage. The ship arrived at Galle on the 7th July last, but had to put out again an account of the current, and did not get back till the 23rd of the same month. She left on the following day for Bombay. On the 25th a great quantity of steam was observed in the fore-hatchway. The captain states he could not at first make out what it was, but the next day (Friday) he found the ship was on fire. The ship kept on her course, and Kennery Light was made out at dusk on the evening of Saturday the 28th. She was boarded by the pilot at 9 o'clock that night, and shortly afterwards there was an explosion, by which the steward met his death. The ship was immediately anchored, and the master left her in order to obtain assistance from the shore. When he returned next morning about a quarter-past 5 o'clock, he found the ship on Karanja shoal. All efforts to extinguish the fire were unsuccessful, and the ship continued to burn till she was consumed.

We are of opinion, after careful consideration of the evidence brought before us, that spontaneous combustion among the coals was the cause of the loss of the ship.

No precaution was neglected by the captain or officers. The holds were examined, and the hatches on the occurrence of rain were attended to.

The court considers no blame can be attached to the officers or anyone on board. All appear to have behaved well in working their vessel into port, knowing her to be on fire, and liable at any hour to explode or burst into flames, when they would have little or no time to take to the boats.

That all on board were in great danger is sufficiently evident by the fact of explosions having occurred shortly after the vessel was anchored, resulting in the loss of one life, and it is also stated that another man was injured.

The court considers that the captain's certificate should be returned to him, and it is returned accordingly.

JOHN CONNON,
Senior Magistrate of Police,
G. O'B. CAREW,
Lieutenant, late Indian Navy.

Confirmed,
W. R. S. FITZGERALD,
Governor.
Bombay Fort Police Court, 13th September, 1869.

"BEACON LIGHT," of St. John's, New Brunswick, of 916 tons register. She was launched at New Brunswick on the 8th September 1869, and classed in the French Lloyds for seven years.

A Marine Court of Inquiry will assemble at the Police Court, Steamer Point, to-morrow morning, the 26th instant, at 7, to investigate and report on the circumstances attendant upon the burning of the ship "Beacon Light."

President: Lieutenant PRIDEAUX, Assistant Resident.
Member: W. K. THYNE, Esq., Harbour Master, and Conservator of the Port.

Aden Residency, 25th January 1871.

The court having assembled pursuant to orders, proceed to read aloud a report handed in by the master of the "Beacon Light," in presence of the officers and crew of that vessel:—

Report of ship "Beacon Light," 916 tons register, of St. Johns, N.B., Fry, master, from Greenock to Rangoon, coals.

September 1st. We towed from tail of bank off Greenoc to Lamlash, and left there on the 2nd. We had light winds and a tedious passage to the Equator; nothing whatever occurring more than is common in any oversea voyage until November 3rd, when Gustav Stoltenhoff, O.S., fell from the cross-jack yard to the deck and was hurt, but no bones broken. On November 8th, at 5.30 p.m., smoke was seen coming up the fore hatch. Master and first mate went into the hold immediately and saw smoke coming up through the cargo at the afterpart of the deck-house on the port side, not far from wood ventilator that went down into the cargo. Immediately took off main hatches and hove coals overboard, so as to be able to get to play water. The force pump was also at once put to work and continued to play water during the night. The main hatch beams and two beams forward were cleared to our view by coals being discharged. The coals and beams on the beams on the port side from main hatch forward to some distance were hot, and it was here the smoke came from. We played great quantities of water from main and force pumps.

November 10th, 6 p.m. We had strong hopes that we were conquerors, but to our utter astonishment, about 3 a.m., on the 11th, great quantities of smoke came from the port side, not allowing any one to go into the hold. We considered it best to batten down main hatches and cut holes in the deck to admit water from main pumps with a hose. In the afternoon removed the long boat from the foreward house to after beams, some hands employed getting sails ready for boats and others pumping.

6.30 p.m. Crew all on deck, some pumping, others in the act of getting sails and painters ready for boats.

With a loud report like a cannon and a flash like lightning all hatches were blown up, fore and aft, carrying the second mate overboard with main hatches, who was seen no more, as night was coming on and great quantities of smoke coming up fore and main hatches, a heavy sea running at the time. The master ordered the boats to be got out for the preservation of life, as there was no chance of saving the ship. The long boat was got out with much difficulty. In getting out the pinnace she was capsized alongside, and John Tompson, seaman, drowned. Everybody, from master to ordinary seaman, used every effort night and day to save the ship. The ship was being steered S.E. by E. in hopes of getting to Tristan d'Acunha. About 9.30 p.m., as near as we could judge, we parted from the ship. Great quantities of smoke were coming from all her hatches. We steered for Tristan, and on Sunday evening saw the land. On the following morning we were met by the kind settlers of that island who had both bread and milk with them in their boat. They joyfully welcomed us to their homes. We were in the boat three nights and two days, in all 61 hours. The boat is left for the good of the settlement on the island. Lat. 35° 31′ S. long. 18° 31′ W. at noon of November 11th, ship run 52 miles S.E. by E., which made us about 274 miles from Tristan when we left the ship.

We, the undersigned members of the crew, declare this to be a true and faithful report of the said ship and her loss.

EDWIN FRY, Master.
GEORGE STOUT, First Mate.
ALBERT JACKSON, Steward.
WILLIAM GILCHRIST.
JOHAN PETER ENGSTRÖN.
T. JANSEN.
H. P. OALSON.
WILLIAM SOUTH.
JACOB GOLDHAMER.
F. KRAMER.
G. STOLTENHOFF.
ROBIE SOUTH.
J. WRIGHT.
J. A. NILSEN.

Ship "Northfleet," January 24, 1871.

Statement of EDWIN FRY, taken upon oath this 26th day of January 1871, which said deponent saith:

The statement presented by me to the court is a true and accurate account of the circumstances attending the burning of the ship "Beacon Light," 916 tons, of New Brunswick (St. John's).

She was launched on the 8th September 1869, at New Brunswick, and was registered in the French Lloyds for seven (7) years. Master's certificate of competency, No. 20,707.

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450 tons of coal, as per bill of lading, were shipped at Penock, consigned to Messrs. Tod, Finlay, & Co., of Rangoon. The coal was hard steam coal from different mines. I was by the ship all the time she was being loaded, with the exception of two days, when I was absent at Liverpool. There were two ventilators, one close to the main hatch, and the other by the after hatch. The ventilators were placed just outside of the coombings of the hatches. The after hatches were nearly always off, and so were the forward hatches. Three ordinary ventilators led to the hold from the deck. They were fixtures. The hatches were not battened down till we met with some bad weather in the Bay of Biscay. Then they were taken off, coming through the N.E. trades, and put on while the rain lasted at the Equator, and the main hatches were not taken off till they were lifted to discharge coal overboard. The after and fore hatches were kept off on every possible occasion. There was very little coal in the fore hold. Three 'tween deck beams in fore hold abaft the foremast were visible.

I heard that an inspector attended the ship at the time of loading, I believe on the part of the shipper of the coal; and I was told he expressed himself satisfied with the ventilators. I do know his name.

The ship was insured last year for 6,000*l.* (30,000 dols.) in America. The policy expired in October 1870, and I am not aware to what amount (if at all) she is insured at present. I am a part owner in the ship to a three-sixteenth share. The only insurance I know is 1,100*l.* advanced on the freight of the vessel for the voyage in which she was lost.

EDWIN FRY.

Before me, this 26th day of January 1871,
W. F. PRIDEAUX,
Asst. Res. and Magistrate.

Re-examined on his former oath.

I have been engaged in carrying coal for several years in one ship, the "Evening Star." I carried six cargoes to the West Indies without a ventilator of any description.

I consider the means of carrying coal as employed in vessels going round the Cape as quite insufficient, for the following reasons:—

1st. That they have not, as a rule, 'tween decks laid fore and aft, so as to separate the cargo. The "Beacon Light" had no 'tween decks.

2ndly. Because different kinds of coal are shipped on board the same vessel. I consider that only coal from one mine should be shipped on one vessel, as different kinds of coal generate different gases.

3rdly. Without fore and aft ventilation I do not consider it safe to carry coal on a long voyage.

I have arrived at these conclusions since the loss of the vessel and in consultation with the master of the ship "Northfleet."

The name of the second mate who was drowned is Joseph Dixon, of Liverpool, England, and of the seaman John Thomson, a Norwegian.

Of the remainder of the crew August F. Rabé, carpenter, of Germany, and Andrew Wilson, able-bodied seaman, of Norway, went on board the American whaling barque "Xantho," of New Bedford, U.S., Captain Lavars, on November 21, 1870.

There were three boats on board at time of explosion—a longboat, pinnace, and gig. The longboat was sufficient to carry crew. At time of casualty all plain sail to top-gallant sails was set.

EDWIN FRY.

Statement of GEORGE STOUT, taken on oath the 26th day of January 1871 which said deponent saith:

I hold a certificate of competency as first mate, No. 87,137, and served as chief officer on board the "Beacon Light."

The statement handed in by the captain, which was read out, is correct.

I joined the "Beacon Light" as first mate about a week before she sailed.

I corroborate as correct the evidence given by the captain with regard to the ventilators and hatches which is now read over to me.

The last of the coals were being taken on board when I joined the ship.

In my opinion, nothing could have been done otherwise than what was done by the master. If the accident occurred over again, I cannot suggest any other means for extinguishing such a fire.

GEORGE STOUT.

Before me, this 26th day of January 1871.
W. F. PRIDEAUX,
Assistant Resident.

Statement of ALBERT JACKSON, taken on oath this 26th day of January 1871, which said deponent saith:

I was steward on board the ship "Beacon Light."

I have heard the statement made by the captain regarding the ventilators and hatches, and it is correct in every particular.

ALBERT JACKSON.

Statement of JAMES WEIGHT, taken on oath this 26th day of January 1871, which said deponent saith:

I was an A.B. seaman on board the ship "Beacon Light."

I have heard the statement made by the captain regarding the ventilators and hatches, and it is correct in every particular.

JAMES WRIGHT.

Statement of ROBIE SOUTH, taken on oath this 26th day of January 1871, which said deponent saith:

I am an ordinary seaman on board the ship "Beacon Light."

I have heard the statement of the captain regarding the ventilators and hatches, and it is correct in every particular.

ROBIE SOUTH.

Opinion of the Court.

The Court having considered the preceding evidence, are of opinion that the statement handed in by the captain and verified by him upon oath is a true and accurate account of the circumstances attending the loss of the ship "Beacon Light," and that the destruction of that vessel was caused by spontaneous combustion.

They consider that all necessary measures were taken by the surviving officers and crew for the preservation of life, that of property being out of the question, and that no blame is attributable to them in any respect.

The court are further of opinion that the remarks made by Captain Fry at the conclusion of his evidence are worthy the consideration of the Board of Trade, with a view to securing greater safety on board of coal vessels proceeding on long voyages.

The court desires, in conclusion, to express their appreciation of the humane conduct displayed by the master of the ship "Northfleet," in receiving the officers and crew of the lost vessel with such a long voyage before him, and beg leave to recommend him to the favourable consideration of the Board of Trade.

W. F. PRIDEAUX,
Asst. Resdt. and Magt., Aden.
W. K. THYNE,
Conservator of the Port, Aden.

Confirmed,
W. R. S. FITZGERALD,
Governor of Bombay.
Aden, 26th January 1871.

"BERNICE," of Liverpool, a sailing vessel of 1,455 tons register, nine years old, and classed A1 at Lloyds, which class would last until June (1873).

Bombay Fort Police Court,
Friday, 4th April 1873.

Pursuant to the Government notification, Marine Department, published in the Government Gazette of the 3rd instant, appointing John Connon, Esquire, Senior Magistrate of Police, and J. E. Betham, Esquire, master of the ship "Princess Somerwatby," to conduct an investigation into the circumstances connected with the total loss by fire of the ship "Bernice," on Saturday, the 22nd March 1873, in latitude 18° 25′ North, longitude 72° 15′ East, the court assembles this day at 11 o'clock a.m., for the purpose stated.

Mr. PEILE, officiating solicitor to Government, appears to watch the case on behalf of Government.

JAMES STANNUS sworn; examined by Mr. PEILE.

I was master of the late ship "Bernice." I have received a copy of the report on which this investigation is held. I hold a certificate of competency as master, granted by the Board of Trade in 1853, No. 9,179. The ship was registered in the port of Liverpool. Her tonnage was 1,455 and 33. She was a sailing vessel, and was built at St. John's, New Brunswick, in 1864. We sailed from Shields on the 9th October 1872. We had coals on board weighing 1,894 tons and 15 cwt. She was classed A1 at Lloyds, which class would last until June next. I believe the ship was insured. I know nothing about the cargo.

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All due and possible precaution was taken with reference to ventilation. There were trunk ventilators at each hatchway, which communicated with fore and aft trunks in the lower hold. I had eight deck ventilators. I have had much experience in hot climates in carrying coals. I never saw a cargo of coals better stowed than this. The coals were dry when they were taken on board, and it was dry weather when they were so taken on board. We had very light winds and hot weather, and made slow progress. Up to the 17th March last there had been no indication of any heating or fire among the coals, and the water in the tanks which were stowed amongst the coal in the after part of the ship remained quite cool. On the 17th March the ship was in latitude 15° 53′ North, longitude 72° 34′ East. At 6 o'clock that morning, in consequence of what the chief officer told me, I went into the fore hold with the chief mate. I cleared away some coal; smoke and vapour were coming out just abaft the foremast. I immediately commenced pouring water over the coals. I put the hatches on, and closed the ventilators in all places to exclude the air. We kept pouring water down night and day, till the flames drove the men away from the pumps. On the 19th March, about 4 o'clock in the morning, an explosion took place, blowing the decks up from the main hatch forward. It blew all the hatches and skylights up, and also the house forward occupied by the men. Several of the men were hurt, two rather severely. Two of the men are now in hospital, and are getting better. After the explosion a great deal of vapour was coming out of the fore part of the ship. The barque "Ocean Belle" was seen that morning, and I signalled to her to come up and remain by us. She did so till we left the ship. On the 22nd, about 6 o'clock in the morning, the flames broke out all over the ship, driving the men away from the pumps, and at 7 o'clock that morning the crew left the ship. I stopped there half-an-hour longer. The foremast had fallen before I left, aud about five minutes after I left the other two masts came down. The ship was all in flames fore and aft. I and the the crew went on board the "Ocean Belle." The "Ocean Belle" remained near the wreck all day. In the middle of the day I went as close to the "Bernice" as I could safely get, and saw that she was a mere shell. There was a great mass of fire and very little smoke. From the time I discovered the fire I did my best to reach Bombay, hoping to keep the fire under till then. The coals belonged to the Peninsular and Oriental Company, and their own surveyor superintended the shipping of the coals in Shields.

By the Court.

I know the ship was insured, but I do not know anything about the cargo. I do not know the amount the ship was insured for; I got instructions about the insurance of the ship. The ship was drawing 22 feet 4½ inches aft, and 22 feet 2½ inches forward. In my judgment the ship was not overloaded; she would have carried 2,000 tons easily. She had 1,894 tons on board. I had every assistance and kindness from the "Ocean Belle." The crew were under proper control. I have been three years in the "Bernice;" I have seen her deeper loaded with salt. We had five boats on board; they were all in good order and ready for use. I saved four boats and sundry other articles belonging to the ship, which have been sold by auction. I saved my nautical instruments, but lost most of my effects.

JAMES STANNUS.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police,
J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

By the Court.

The reason why I stopped the ventilation when the ship was on fire was because I thought and always understood that stopping the ventilation was the best way of preventing fire breaking out.

JAMES STANNUS.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police,
J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

PHILIP COUTANCHE sworn; examined by Mr. PEILE.

I was the chief officer of the ship "Bernice." I was on board when the cargo of coals was taken on board at Shields. The cargo was properly stowed, and every precaution was taken with regard to ventilation. We left Shields on the 8th or 9th October 1872. We had light and contrary winds and the weather was very hot. Nothing particular occurred on the voyage, and there was no indication of heat in the vessel or the coals being on fire until the 17th March. At daylight on that morning I noticed steam and smoke coming out of the fore hatchway, and I immediately informed the captain. The captain and I went below and examined the coals. We moved some of the coals and poured water down where we thought the fire was. After pouring a certain quantity of water on the coals, we put on all the hatches and stopped all ventilation except where we were pouring water down. We continued the pumping night and day, and never stopped. On the 19th, at 4 o'clock in the morning, there was an explosion. It blew the decks up in the fore part, also all the hatches and the forehouse. We continued pouring water down after the explosion. The ship was kept by the wind making the best of her way for Bombay. At 6 o'clock in the morning of the 22nd the flames broke out under the fore house, and then all over the ship. The "Ocean Belle" was near us at the time. When the sails forward took fire the crew left the ship and went on board the "Ocean Belle." I left the ship at half-past 7 that morning. The foremast was then over the side, and the mainmast was tottering and it came down about a quarter of an hour afterwards, and brought the mizzenmast down with it. The ship afterwards broke out in flames all over, fore and aft.

By the Court.

I joined the ship a month before we left Shields, and was on board all the time the coals were being taken on board. We were in the dock. The coals were quite dry. I have been in ships carrying coals before. I have been in two other ships bound for Bombay with coals. I think the ventilation on board the "Bernice" was the best I ever saw. There was no suspicion of fire till the morning of the 17th March. The crew behaved very well till the explosion occurred. They then seemed a little frightened. We were well received by the "Ocean Belle."

PHILIP COUTANCHE.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police,
J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

ANDREW DRYBURGH sworn; examined by Mr. PEILE.

I was carpenter on board the "Bernice." I was on board the ship when she was taking on board her cargo at Shields. The ventilating apparatus was all fitted before I went on board. I never saw a ship ventilated before. The other ships I have been on board of made short passages only. The ship was staunch and strong when she left Shields on the 9th October. She was tight all the passage. Up to the 17th March nothing particular happened. I was on board that morning, when smoke was seen coming out of the fore hatch. I and the chief mate went down the fore hold to try and find out where the fire was. We started the pumps pouring water over the coals about an hour afterwards. I think the hatches were put on the next day. We continued pouring water on the coals. The hatches were all put on. I remember the explosion taking place on the Thursday. Smoke was first observed on the Tuesday. The explosion occurred before daylight. The fore part of the ship was blown up. It was a loud explosion; several of the men were hurt. The boats were put out, and then we started pumping again. On the Sunday following flames burst out underneath the house in the fore part of the ship. That morning we left the ship and went on board the "Ocean Belle." Shortly after we left the ship the foremast fell, and about an hour afterwards the mainmast and mizzenmast fell. The flames broke out all over the ship after that.

By the Court.

The captain ordered the hatches to be put on. The ship made no water all the way out. I sounded the pumps every day, sometimes twice, all the way out. It is my practice to do so.

ANDREW DRYBURGH.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police.
J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

WILLIAM ELLIOT JARVIS sworn; examined by Mr. PEILE.

I am the master of the "Ocean Belle," lately arrived in Bombay on a voyage from Swansea with coals. On a Thursday morning in March last, in consequence of signals, I passed close under the lee of the ship "Bernice." I was

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led by Captain Stannus, who told me his ship was on fire. I went on board. I found the decks were blown up from the main hatch forward, and the forehouse, and some of the men were lying about the deck injured. There was a little smoke coming out of the hold. I sent my second mate and three hands on board to assist. I could not spare any more hands, as mine is a small vessel. On the Saturday afternoon I took on board my ship the effects of the crew of the "Bernice," in order to encourage them to work. On the Sunday morning, about 6 o'clock or half-past 6, I saw the flames break out on board the "Bernice," in the forehouse. The crew of the "Bernice" then came on board the "Ocean Belle." At the time they came on board all the masts were gone on board the "Bernice." The master of the "Bernice" afterwards came on board. We remained by the ship allday, and about 12 o'clock in the day we went close past her, and I went up into the rigging to look at the "Bernice," and saw she was nothing but a shell and a mass of red hot cinders. All the time from the time I first went to the "Bernice" till the ship was burnt we were making the best of our way to Bombay.

By the Court.

All sail was set on the "Bernice" up to Sunday morning or until the flames broke out on board.

W. E. JARVIS.

Taken on oath before us,
JOHN CONNON,
Senior Magistrate of Police.
J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

Report of the Court.

Bombay Fort Police Court,
Monday, 7th April 1873.

Pursuant to the Government resolution, Marine Department, and notification published in the Government Gazette of the 3rd instant, appointing John Connon, Esq., Senior Magistrate of Police, and J. E. Betham, Esq., master of the ship "Princess Somerwatby," to conduct an investigation into the circumstances connected with the total loss by fire of the ship "Bernice" on Saturday, the 22nd March 1873, in latitude 18° 25′ North, longitude 72° 15′ East, the court assembled for the purpose stated on the dates mentioned in the record of proceedings.

From the evidence adduced before us relative to the loss of the "Bernice" by fire, we find that nothing of any consequence appears to have occurred on board the ship till the morning of the 17th March last, when the ship was within 200 miles of Bombay.

At that time smoke and vapour were seen to be coming out of the hold just abaft the foremast.

The vessel appears to have been properly laden and well ventilated, and all due precautions seem to have been taken to guard against fire. The cargo consisted entirely of coal, of which there were 1,894 tons 15 cwts. on board. The registered tonnage of the ship was 1,455 tons, and the captain says that she was fit to carry 2,000 tons, which we believe. The ship left Shields bound for Bombay by way of the Cape of Good Hope on the 9th October 1872. The ship was thus over five months at sea when the fire was discovered among the coals. We are satisfied by the evidence that the ship was well found, well manned, and equipped, and the long passage is accounted for by light and contrary winds.

When the fire was discovered all possible means were, as appears to us, promptly adopted to extinguish it. But notwithstanding the efforts made by the master and by his officers and crew to save the ship from destruction, the fire made rapid progress, and on the morning of the 19th March, about 4 o'clock, an explosion took place, when the decks were blown up from the main hatch forward, also the hatches, skylight, and deck-house forward occupied by the crew. Several of the men were hurt, two severely.

After the explosion Captain Stannus states that he observed much vapour coming out of the fore part of the ship.

Fortunately the barque "Ocean Belle," an English ship, was seen in the morning the explosion occurred on board the "Bernice," and Captain Stannus signalled to the "Ocean Belle" for assistance, Captain Jarvis of the "Ocean Belle" immediately sent such assistance to the "Bernice" as he could. His men well assisted the crew of the ship in danger to work the pumps in the way of playing water on the cargo, keeping the decks flooded, &c., and we are of opinion that every effort which could have been made was made to put out the fire.

On the morning of the 22nd, however, about 6 o'clock, flames broke out all over the ship. The men were driven away from the pumps by the flames, and at 7 o'clock they were compelled to leave the ship, but they did not do so without the leave of the captain. The captain himself remained on board half an hour longer. Before he left the ship the foremast had fallen, and about five minutes after he left the ship the other two masts fell, the ship being then all in flames fore and aft.

The "Ocean Belle" remained near the wreck all day. In the middle of the day Captain Stannus and Captain Jarvis went as close to the "Bernice" as they could with safety, and saw that the vessel had been burnt down to a mere shell.

From the time the fire was discovered Captain Stannus made every effort to reach Bombay, thinking that he might possibly keep the fire under till then and be able to save his ship.

In view of all the facts as they have appeared before us in evidence, we consider that the destruction of the "Bernice" was caused by spontaneous combustion among the coal, which may have been owing in some measure to the long time the ship was at sea before she got near Bombay.

We are of opinion that no blame attaches to the master of the "Bernice," or to his officers or his crew. They have been the victims of a common misfortune, and all seem to have worked with judgment and care in their respective positions, and did all they could do to extinguish the fire and save the ship.

The captain of the "Bernice" holds a certificate of competency from the Board of Trade dated 20 years ago, and under the circumstances narrated in this report, and referring to the evidence taken before us, of which evidence we submit full notes, we have not thought it necessary to detain this certificate, though it was duly tendered us, and we have accordingly returned it to him.

We wish to add a word as to the captain of the "Ocean Belle." He seems to us to have behaved under the circumstances with most considerate humanity, and although that is not more than we should expect of any British seaman, we are of opinion that both before and after the disaster (as he brought the captain and crew of the lost ship all to Bombay in his own small ship and treated them well) he deserves honourable mention, that his conduct should be brought to the notice of the Government, as we now respectfully bring it, and that if the Government is so pleased, it should be brought to the notice of the Board of Trade as well.

JOHN CONNON,
Senior Magistrate of Police.

J. E. BETHAM,
Captain of the ship "Princess Somerwatby."

Bombay Fort Police Court,
7th April 1873.

Confirmed,
J. WODEHOUSE.
May 5th, 1873.

"COUNTY OF NAIRN," of Glasgow, of 990 tons register, four years old.

Report of the proceedings at a Court of Inquiry held at the office of H.B.M. Acting Vice-Consul at Sourabaya on the 23rd day of August 1873, for the purpose of investigating the circumstances attending the loss of the British ship "County of Nairn," of Glasgow, Richard McKenzie, master.

Present:

ALEXANDER HADAWAY, H.B.M. Acting Vice-Consul, President.
N. MCVICAR, partner of the firm of Messrs. Martin, Dyce, & Co.
JAMES GREIG, procuration holder of the firm of Messrs. Pitcairn, Syme, & Co.
ALEXANDER MCNAB, master of the British ship "Daniel Rankin."

The president, having duly sworn the members of the court, explained to them the nature of the inquiry about to be instituted.

Captain McKenzie was then called and duly sworn, and in reply to questions put by the court, stated that he was 46 years of age. Had held a master's certificate for 16 years, and had been 6 years in the employ of the owners of the "County of Nairn." He once before had an accident with a vessel under his command; it was in 1859, and happened on the west coast of Scotland.

On being requested by the court to state the circumstances connected with the loss of the vessel, Captain McKenzie referred to his logbook, the entries in which from

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the 12th to the 16th August were then read out by the president as follows:—

Tuesday, the 12th August 1873.

Courses.	Winds.	
S.E. by E.	N.N.E.	a.m. Light wind and very variable. 2 a.m. steady; 8, tacked ship; 8.30, galley caught fire; it was soon put out, doing little harm; people variously employed.
S.E. by E.	East.	
S.S.E.	,,	Noon, tacked ship; 1 tacked
S. by E. ½ E.	E. ½ S.	ship. p.m. Discovered smoke issuing from the coals on port side of main hatch; called all hands; passed pig iron on deck; removed boxes, crates, &c; from place around the smoke; played water on it.
E.S.E.	N.E.	5. Passed the powder on poop, and covered it the best we could with sails, tarpaulings, &c.
N.N.E.	—	Latter port, water kept playing on it to keep it down. 11. Hard breeze came off, tacked ship to Eastward.

Wednesday, 13th August.

N.E. by E. ½ E.	S.E. ½ E.	a.m. Moderate breeze and clear weather. 4 a.m. do. do. 6 a.m. Crimon Java, bore N.N.W. 4 miles; found the smoke coming out all over in square of main hatch; cleared all cargo out of the road, and kept water going on it; it feels very warm; all hatches are on but one of the hatches at the main for to get water down. The smell of gas is so strong that it almost chokes the people in the hold. Noon, fine breeze; p.m., moderate breeze and fine clear weather. 2 p.m. Tacked ship. Still playing water on the coals; they are getting much worse. 11 p.m. Tacked ship. Still keeping going; smoke all over the deck; can't sleep in forecastle for gas. Midnight. Squally with rain; pumps attended to
N.E. by E.	S.E. by E.	
E.N.E.	S.E.	
E. by N.	S.E. by S.	
S.W. by S.		
South.	E.S.E.	
S. by E.	E. by S.	

Thursday, 14th August.

S.E. ½ E.	S.S.W.	a.m. Fine breeze and clear weather. 4 a.m. Do. do. do. There is smoke coming out all round the mainmast; took more pig iron. On deck and shifted more cargo, keeping water on it. 10 a.m. People cannot stop below, it is increasing so very fast. Smoke is like to suffocate us about main hatch; there is smoke coming out of all three lower masts heads, and p.m., now fearing that the coals are become ignited, judged it is prudent to make for the western channel to Sourabaya, to scuttle ship on bank, and get assistance. 6·46 p.m. Tacked ship to S.E.; at 9 p.m., sighted light-ship; at 9.30, wind hauled off the land, which taking the ship aback, obliged us to come to anchor in 7 fathoms water, with 30 fathoms chain on port. Light-ship bearing S.E., Panka Point S.W. and while in the act of clewing up the sail, flames burst up the main hatch; at once the order was given to heave gunpowder over board, and then to get out the three boats on beams aft; left the ship and lay by her; flames half up the mainmast.
S.S.E.	S.W.	
S.E.	Variable.	

Friday, 15th August.

	a.m. Flames stopping, judged it safe to board the ship; hove short and made sail ready to run the ship on the bank. 6 a.m. Spoke the schooner "Duke of Richmond," bound to Sourabaya; desired him to report ship on fire, and we did intend to scuttle her. Wind came in favour, weighed anchor, and proceeded towards the bank; wind light and coming right out, at the same time tide being against us we had to let go anchor again in 5 fathoms water; all keep playing water on fire. 11 a.m. Received on board a pilot; sea-breeze came strong, which caused the flames to increase very fast in the hold, but it keeps under hatches. 1 p.m. Tripped anchor and run the ship on-shore, Panka Point. Bearing W. ½ S. ¼ a mile; two anchors let go and bored holes to scuttle ship; while in the act of scuttling her, ship burst out in flames, forcing us to take to the boats as fast as we could assisted by two of the Panka pilot boats, saving but very little, amounting to gig, pinnace, and life-boat, with their gear, several bolts of canvas, chronometers, barometers, and compass landed with boats at Panka Point, ship being in one complete mass of flames fore and aft.

Saturday, 16th August.

	a.m. Daylight, all masts over the side, and giboom and hull of the ship burned to the water's edge; ship not being full of water to cover all the fire, made carpenter cut large hole to let water run in faster, which completely scuttled her; finding that nothing could be saved, got boats from Resident of Sedayoe, and proceeded to Sourabaya with crew, leaving the wreck of ship in charge of the Resident, with orders to keep a strict watch till further orders.

We, the undersigned, hereby certify that the above is a

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true and correct copy of the log-book of the "County of Nairn" from the 12th to the 16th August.

ALEX. HADAWAY,
H.B.M.'s Acting Vice-Consul.
NEIL MCVICAR,
Partner of the firm of Martin Dyce & Co.
JAMES GREIG,
Procuration holder of the firm of Pitcairn, Lyme, & Co.
ALEX. MCNAB,
Master of ship "Daniel Rankin."

CAPTAIN MCKENZIE stated further: Shortly before noon on the 12th, we lay a little to the west of the Island of Carimon, Java. I then steered for land due south, a light wind blowing from E. ½ S., but later on a land breeze springing up, I was forced to sail off land. Until the 13th, I did not look upon the fire as serious, and then from the position of the ship and the direction of the wind, it was easier to make for Panka Point than Samarang. When the log-book says the galley was on fire, it is incorrect, it should be a fire was in the galley. It was of a trifling nature, and was caused by the upsetting of some fat out of one of the pans into the fire. The woodwork over the fire was merely blistered; no sparks could possibly have come out of the galley and supposing a few had, it was impossible that they could have reached the hold. When the smoke first appeared, I accounted for it that the coals were either on fire or smouldering. I consider that there was sufficient ventilation for the coals on board. Altogether there were 600 tons, and they were stowed in two portions, one portion consisting of 400 tons was stowed directly under the main hatch and separated from the other portion, consisting of the remaining 200 tons, by a pile of crates. Both portions were about 13 to 14 feet deep at their deepest part, gradually tapering off towards the fore hatch and stern respectively. I am unable to say whether the coal was damp when taken in. When the smell of gas was first reported, I went below, and seeing nothing, ordered the hatches to be left open to carry away the smell. When we tacked at noon on the 12th, the hatches were still open, but they were afterwards closed. I have often carried the same quantity of coal with no better ventilation. I tried to get up a portion of the cargo, first passed up the gunpowder, after which we found it impossible to remain below. I then proceeded with all despatch to reach Panka Point, on purpose to scuttle the ship, which was the only way of saving either ship or cargo. I had pumps and a fire-engine with a long hose, all of which were in good order; we had also a good supply of buckets, which were used.

WILLIAM THIRD, first officer, was now called, and having been duly sworn, deposed as follows:—

I am 31 years of age. I have held a master's certificate for two years, Have been 17 months on board the "County of Nairn." The log-book was written by me, and I confirm its contents. When the fire in the galley took place, the cook, who acted also in the capacity of steward, was aft attending the captain and myself at breakfast. The paint in the galley was merely blistered, no other damage was done; and by the time the captain and I got forward, the fire had been put out. I am unable to account for the coals getting on fire, the ventilation was good, in fact better than in most vessels in which I have served.

He confirmed Captain McKenzie's statement as to the manner in which the coals were stowed.

The fire must have commenced in the coals stowed directly under the main hatch. The crates being stowed between the two lots of coal would assist the ventilation, the masts were ventilators, as they were of iron and had the usual holes, which I know were not plugged up, as when stowing the coal, I myself had them cleaned out. The coals were dry when taken in. I have often been in coal ships before, and in some without any ventilation whatever. While in Batavia the coals were never touched, neither was there any smell of gas detected.

He confirmed Captain McKenzie's statement as to the first discovery of smoke. When the pig iron, boxes, &c. had been cleared away, I distinctly saw smoke coming up through the coal. I have no reason to suppose that there was any carelessness on the part of the crew. It was impossible to scuttle the vessel before we did. The holes for scuttling were all bored from the outside. An unsuccessful attempt was made to save the sails, but it was impossible attempting to save any of the cargo. Between decks fore and aft she was one mass of flames. I cannot understand how it was she lasted as long as she did; and when the flames did burst out, I had to spring off the bows to gain the boats.

ROBERT BREMNER, second mate, was now called, and having been duly sworn, gave the following evidence:—

I am 25 years of age. I hold a first mate's certificate, and have served for about two years in this vessel. It was my watch when the smell of gas was first detected. It was reported to me by Collins, who had opened the fore hatch in order to go below for a small piece of wood. I tried to go down the fore hatch, but the smell of the gas almost choked me. I went and reported to the captain. The vessel was well ventilated. The masts were not plugged. I consider the mainmast was a good ventilator.

He confirmed Captain McKenzie and the first mate as to the stowing of the coal. The coal was dry when taken in; cannot say cause of fire. In Batavia, I was in the hold every day for 12 hours, and there was then no sign of anything going wrong.

When we tacked on the 12th, this being about the time the smoke was first discovered the hatches were open. There was no carelessness on the part of the crew which could have occasioned the fire. The fire in the galley was nothing; it was no fire at all.

COLLINS, A.B., was now called, and having been duly sworn, deposed as follows:—

I am a Canadian, and am 30 years of age. I went to the forehatch for the purpose of going below to get a piece of wood, but upon lifting the hatch, the smell of gas was so strong I could not descend. I then reported to the second mate, who went forward to see what was the matter. I was never before in a vessel laden with coals. From what we could see by digging in the coals through which the smoke was issuing, and which at first were not so hot as to prevent our standing on them, it is my opinion, and that of the rest of the sailors, that the fire was at the very bottom of the coals. I saw smoke coming out of the masts.

What Collins stated with respect to galley fire confirmed Captain McKenzie's statement.

JAMES LESLEY, carpenter, was now called, and having been duly sworn, stated as follows:—

I am 23 years of age, and have served three and a half months on board the "County of Nairn." I previously served on board a steamer. He confirmed Captain McKenzie's statement in regard to fire in the galley. When smoke was first reported I was at my usual work. I consider there was sufficient ventilation. I know nothing about the stowage of the cargo. I joined the vessel the day she sailed. It was I who scuttled the vessel. I worked first from a boat, afterwards from a stage slung on the outside of the ship, and as the swell rose and fell I was sometimes almost submerged, in fact it was with great danger to both life and limb that I succeeded in doing what I did. I bored five holes 1¼ inches in diameter in each side of the vessel, having first removed the copper. There was no possibility of cutting out a square block. I consider my best was done to scuttle the vessel; in fact there was no other way. The vessel was well supplied in case of fire.

CHARLES MARSHALL, A.B., was now called, and having been duly sworn, deposed as follows:—

I am 37 years of age. Have served three and a half months on board the "County of Nairn." I was at the wheel when smoke was first reported. From 12 a.m. to 2 p.m. we were on the starboard tack. I saw smoke coming up through the coal from underneath the beams. Everything was done that could be done to put the fire out.

JOHN RUSSELL, cook and steward, was now called, and having been duly sworn, gave the following evidence:—

He confirmed Captain McKenzie's statement in regard to origin of the fire in the galley. The paint which was blistered had not fallen off, and did not come off until I had scraped it off. I never before went as cook and steward.

ARCHIBALD GRAHAM, boatswain, was now called, and having been duly sworn, stated as follows:—

I have been three and a half months on board the "County of Nairn." I have been four years at sea. It was not my watch when the smell of gas was first discovered. I was below when the smell of gas was reported. The captain went down forward and came up aft, but could see nothing.

We were tacking the ship when smoke appeared. The hatches were open, but they were afterwards closed. There was no carelessness on the part of the crew with regard to lights.

Decision.

We, the undersigned, having duly weighed the evidence adduced, give it as our opinion that the loss of the British ship "County of Nairn" was caused by fire, the origin of which is unknown, but supposed to be spontaneous combustion of the coals in the lower middle part of the ship. Considering the limited quantity of coals on board, and the

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manner in which they were stowed, we are satisfied that the means of ventilation were sufficient, and that everything that could be done was done, after discovery of the fire, to put it out. We are further of opinion that, from the position of the ship and direction of the wind at the time the smoke was discovered, the captain acted rightly in steering the course he did, and finally scuttling the ship at Panka Point. We thus exonerate Captain Richard McKenzie from all blame, and consider that he and his officers acted with energy and judgment throughout.

ALEX. HADAWAY,
H.B.M.'s Acting Vice-Consul, President.
NEILE MACVICAR,
Partner of the firm of Martin Dyce & Co.
JAMES GREIG,
Procuration holder of the firm of Pitcairn, Syme, & Co.
ALEX. MCNAB,
Master of British ship "Daniel Rankin."

"PRINCE ALFRED" Barque, of Shoreham, of 368 tons register, 5 years old, and classed at Lloyds A1 9, years.

Proceedings of the Mauritius Marine Board in the case of the bark "Prince Alfred" of Shoreham, of the burthen of 368 tons, Henry Puttick, master, which vessel was burnt in latitude 23° 30′ S. and longitude 79° 56′ E. on the 31st August last, on her voyage from Hull to Point de Galle.

The Board assembled at the Port Office on the 14th September 1873.

Were present:

JOHN MORGAN, Esq., Acting Harbour Master and President.

J. COWIN, Esqre.,
W. A. BARCLAY, Esq.,
J. P. ELLIS, Esqre. } Marine Surveyors.

Assisted by:

Captain T. MILES, Barque "Umvoti."

Presented themselves for examination:

Henry Puttick, master; James Saunders, mate; Peter Thomson, boatswain; Jelmar Wilkman, A.B., of the late barque "Prince Alfred."

The following documents were laid before the Board:—

1. The Official Log book.
2. The Chart by which the vessel was navigated.

All the evidence was on oath.

HENRY PUTTICK sworn:

39 years old; born at Shoreham. Have been 19 years to sea. Have been in command about 8 years. Have a certificate of competency. Have been 2½ years in command of the barque "Prince Alfred." The vessel was built at Shoreham, in 1868. She is, I believe, not insured; classed at Lloyds A1, 9 years; docked and re-metalled in May last at Hull. The vessel was in a proper and seaworthy condition when she left home; continued so throughout, up to the time of the accident. Smoke was first seen on the 30th August, no symptoms before that. At 5 a.m., on the 30th August; the first indication of fire was in the forecastle, reported by the men to the mate and afterwards to me, and I came on deck and saw smoke coming out of the forehatch. I went down in the hold and felt the coals; they appeared quite cold. We then took off the main hatches and trimmed cargo on deck, from 15 to 20 tons; about 4 feet down found the cargo quite hot. We poured water in about one hour and a half, it getting so hot, that the men could not stop down. No ventilation through the cargo. We shortened sail, hauled up the courses, hove the ship too, main topsail aback, and battened down all hatches. The vessel was going free. I did all in my power to save ship and cargo. The vessel was from Hull with a cargo of steam coals for Point de Galle. My vessel was inspected by Lloyds' Surveyor to take in any cargo. We then put out the long boat, provisioned her, passed her astern with two men remaining in her, the remainder stopping on board the ship. At 3 a.m. on the 31st of August, fire broke through the port covering board between the fore and main rigging; put out the small boat and laid by the ship till daylight, then myself and one man went on board and found her burning furiously. I went down in the cabin to get some more provisions and the man with me; smoke being so suffocating that I could hardly get up the ladder, when I got in the air I fell down insensible and the man having to heave water over me to bring me too, sufficiently to get in the boat. About noon on the 31st of August I abandoned the ship in latitude 24° 30′ S. and longitude 79° 56′ E. the ship being on fire and burning furiously. No smell of gas or sign of smoke previous to the 30th of August. I do not know the quality of coals put on board. It was rainy weather at the time they were shipped. I have taken many cargoes of coal before; never used ventilators through the cargo; was neither suggested to me, nor did I consider it necessary this voyage. I beg of the Board to record my grateful thanks for the humane and kind treatment I received myself and crew from Captain Pichon of the French barque "Boussole" from the time he picked us up till he landed us here in the Mauritius, which caused a serious deviation from his voyage.

JAMES SAUNDERS sworn:

31 years old, born at Shoreham. I have been 15 years at sea. I have been mate of the barque "Prince Alfred" for 2½ years, and have been 5 years as boatswain and mate in other ships. I was on board the vessel when she was in dock and re-metalled. Rainy weather when the coals were shipped. The vessel was tight and in a proper and seaworthy condition, and continued so throughout till the accident. At 5 a.m. on the 30th of August, smoke first reported to me by the men in the forecastle and I reported it to the captain. There being a nasty smell of gas in the hold, took off the hatches and trimmed cargo on deck; finding the coals quite hot about 4 feet under the main hatch, put down water, trying to stop it, could not succeed, and the cargo getting so hot, that the men could not stop in the hold, put on the hatches and battened down, ship going free. Took in sail and hove the ship to; got the long boat ready, put her out, provisioned her, and passed her astern with two men in her, the remainder stopping on board. About 4 a.m., on the 31st August, saw the fire coming up through the port covering board amidships; put the small boat out and laid by the ship till daylight, when the master and one man went on board and found the ship burning furiously. The master and man went in the cabin to get more provisions, the smoke being so suffocating that they could not stop. The master on getting on deck fell insensible, the man having to heave water over him to bring him to. (This information I got from the man who accompanied the captain.)

We tried to extinguish the fire by pouring water in the fore and main hatch for an hour and a half, but without avail. I beg leave to bring to the notice of the Board the kind and humane treatment we all received from Captain Pichon and his men of the French barque "Boussole" from the time we were picked up till the time we landed in the Mauritius.

PETER THOMSON sworn:

27 years old. Boatswain of the barque "Prince Alfred." Born in Iceland; joined the vessel in May ultimo, at Hull. The ship was loaded when I joined her. The vessel was in a proper and seaworthy condition to the time of her accident. She was not overladen. Smoke was first seen in the forehatch; opened the forehatch first and smelt a nasty smell. The crew lived in the forecastle. Poured water down in the hold for about 2 hours; trimmed cargo, put coals on deck from the main hatchway; found the coals too hot and the men could not stop down below. Battened the hatches down, took in the small sails, hauled up the courses, and hove the vessel too; main topsail aback, got the things ready for the boat. The captain ordered the long boat to be put out, provisioned her and passed her astern. Two hands were in the boat. We left the ship at 4 a.m., fire was through the covering board, pitch was boiling out the seams of the deck, the deck was so hot so that we could not stand on. The captain, in my opinion, tried all he could to save the ship and cargo. There were no signs whatsoever of smoke or gas until the morning of the 30th August.

JELMER WILKMAN,

Born in Sweden. 22 years old; A.B. I joined the vessel at Hull, the vessel being laden. I have been three years to sea. The vessel was tight and in a proper and seaworthy condition from leaving Hull to the time of her accident. I smelt the smoke in the forecastle at 4 a.m. I came on deck, and at 6 a.m. I took the wheel and saw the smoke coming from the fore hatchway; water was poured down in the fore and main hatchways. The coals were taken out and the water was poured down. The coals were so hot that I could not remain below and the farther I went down the hotter it became. When I came up the captain gave the orders to batten the hatches down and shorten sails; sails were shortened and vessel hove to. We got the long boat out ready, provisioned, and passed astern, and put two men in her. Remained on board till Sunday at 4 a.m. When we left the ship, the fire came through

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the covering board from the port side, with great quantities of smoke. At about 10 a.m. again boarded the ship with the captain to try to get some more provisions. When we got on board the cabin was full of smoke. I assisted in putting the bread in the boat, and on my return I found the captain lying on the deck senseless, and blood running from his nose. I took a bucket of water and hove it over his head, which brought the captain round. We then left the vessel. We were in sight of the vessel all day, and at night time there was a glare.

Report.

The "Prince Alfred" was built and registered at Shoreham, in 1868; official number 58,023, and classed A1 9 years at Lloyd's; she was flushdecked, barque rigged, and 368 tons register. She was owned by Thomas Gates, Esq. shipowner, of New Road, Shoreham, and commanded by Mr. Henry Puttick, who holds a certificate of competency as master mariner, number 89,520, and was bound from Hull to Point de Galle (Ceylon) with a cargo of 614 tons of steam coals. The "Prince Alfred" left the Humber on the morning of the 5th of June. She was then tight, staunch, and in every way seaworthy, and continued so up to the time of her loss. The voyage was successful up to the 30th August, when smoke was observed in the forecastle, and on examination, it was evident from the heated temperature that combustion was going on; the hatches were taken off, and water was freely poured down the forehold on the coals. About 15 tons of cargo was dug out of the main hold, and hove on deck, in the hope of getting at the real seat of the fire. The men remained at work till driven on deck by the heat and the rapidly increasing volume of gas and smoke; it was then 8 p.m., the hatches were ordered to be put on and battened down, the light sails and courses clued up, and the vessel hove to; the long boat was then got out and rigged, her sails and rigging being below; a small supply of provisions and water was put into her and she was passed astern with two men in her, the rest of the crew remaining on board, still hoping that the fire might smother. At 4 a.m., on the morning of the 31st, the fire broke through the covering board on the port side amidships, the jolly boat was then put out and the master and crew left the vessel and took to the boats, but remained by her until daylight when the master and one of the crew went on board to try and get some more provisions and found the vessel burning with great fury; the master went down in the cabin, the smell and smoke almost suffocating him. He just managed to crawl on deck when he fell down senseless and bleeding at the nose. The man that was with him had the presence of mind in heaving water over him, which brought him sufficiently round to get him back into the boat. At noon, finding the ship to be hopelessly on fire, and having only a small supply of provisions and water, the nearest land being Rodrigues, which was 1,000 miles off; they left the vessel; Mauritius then bore from the west 1,388 miles. The master was the last to leave and the whole proceedings, in the opinion of the Board, are marked with judgment and prudence and highly commendable. As the jolly boat, which was in tow of the long boat prevented their progress she was cast off and turned adrift on the 7th day after leaving the vessel. Having gone a distance of 900 miles they were when in latitude 19° 39′ S., longitude 62° 30′ E., fortunately picked up by the French barque "Boussole," Captain René Marie Pichon, who treated them with great kindness.

The Board cannot close this report without reminding the authorities of the great want of precaution in loading a combustible cargo, such as coals, without the vessel being properly ventilated; this ought to be made compulsory on vessels accepting charters to carry coals on a long passage. Here is a fine vessel lost, valuable lives risked, whereas, if ordinary precautions of ventilating the vessel had she been attended to, she might have been saved.

The Board are therefore of opinion that the evidence on oath of the captain, officers, and of the crew, is a true and accurate account of the circumstances attending the loss of the "Prince Alfred," and that the destruction of the vessel was caused by spontaneous combustion, and consider that all necessary measures were taken by them to extinguish the fire, and that no blame whatever is attached to the Captain, officers, and crew, and have much pleasure in returning Captain Henry Puttick and Mr. James Saunders, chief officer, their certificates.

The pleasing duty now remains of recording the generous and hospitable treatment received by the master, officers, and crew of the unfortunate "Prince Alfred" from Captain René Marie Pichon, of the French barque "Boussole," to which ample testimony was borne in receiving them on board of his vessel, having a long voyage before him, and having come out of his course to land them here, by which his vessel would lose at least four days; we therefore beg leave to recommend him to the favourable consideration of the Board of Trade.

JOHN MORGAN,
Acting Harbour Master and President of the Board.

JOHN P. ELLIS,
JOHN COWIN,
A. W. BARCLAY,
} Marine Surveyors.

THOS. MILES,
Captain of the barque "Umvoti."

"ST. MUNGO," of Glasgow, iron ship of 1,375 tons register, eight years old, classed A1 for 21 years.

Proceedings of the Mauritius Marine Board in the case of the ship "St. Mungo," of Glasgow, of the burden of 1,375 tons, Frederick Broom, Master, which vessel was burnt in latitude 34° 57′ South, and longitude 20° 18′ West, on the 13th September last, on her voyage from Dundee to Point de Galle.

The Board assembled at the Port Office on Monday the 20th October 1873.

Were present:

JOHN MORGAN, Esq., Acting Harbour Master and President.
JOHN COWIN, Esq.,
W. A. BARCLAY, Esq.,
} Marine Surveyors.

Assisted by:

Captain J. ANDERSON, barque "Lorton Vale."
Captain W. H. METCALF, ship "Beechardass Ambaidass."

Presented themselves for examination:

Frederick Broom, master; John Henry Buckler, first mate; Alexander Scott, second mate; William Ross, steward; George Wilkie, carpenter; Charles Reilly, A.B.; John Miller, A.B., of the late ship "St. Mungo."

W. H. Hathorne, master of the American barque "Taria Topan."

The following documents were laid before the Board:—

1. The official log-book.
2. The chart by which the vessel was navigated.

All evidence was on oath.

FREDERICK BROOM sworn:

30 years old; born at Rochester; holds a certificate of competency. Has been to sea 16 years. Has been 12 months in command of the ship "St. Mungo." Was my first command. The vessel was insured; she was built in 1865; she was classed A1 21 years. The vessel was tight, and in a proper and seaworthy condition when leaving Dundee. First symptoms of smoke were seen on the morning of the 13th September. The vessel left Dundee on the 9th July; had a full cargo; was not overladen; she had about 500 tons of coals in the tween decks; her draught of water was 20 feet 3 inches when we left. No symptoms of smoke or smell were discovered before the morning of the 13th September. The ship was well ventilated (nine ventilators), one ventilator went down through each hatchway down to the kelson, two on the poop went through the main deck, two through the main deck between the fore and main hatchways, two through the main and top gallant forecastle deck. After the first appearance of smoke my first order was to get all stores of a combustible nature upon deck; whilst that was being done, I went down in the hold accompanied by one of the seamen. The steward, William Ross, was the first person who saw the smoke at 8.15 a.m., on the 13th September, issuing from the after-hatch ventilator and reported it to me. I could not stop long down the hold on account of the smell of the gas, and had great difficulty in getting on deck again. The man Robertson was with me, but he did not appear to be as much exhausted as I. When I came on deck I ordered everything to be battened down. During the time they were battening down hatches I went down the three ventilators followed by the chief officer, and found cool from kelson to about six feet up, the smell of the gas being so strong below that no one could stand to work. No wet coals were taken on board at Dundee. 4 p.m., everything appearing cool and no smoke observable, I had one of the ventilators on the poop opened to allow the foul air, if any had generated, to escape. I allowed it to remain off for a short time and then put it on again. After this precaution I felt no fear of an explosion. At

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8 p.m. the crew came aft and asked me to close on a barque which had been in company with us to windward all day, but I had already altered my course so as to keep her in signal distance. At 10 p.m. and also at midnight there appeared to be no presence of fire. At 3 a.m., the fore, main, and after hatches blew off with a terrific roar, and a flame leaping half way up the mainmast and immediately going out, but dense volumes of smoke arising from all hatches. I immediately set all hands drawing water and pumping with both force pumps down the mainhatch, and cut holes in the deck as well, and as soon as the smoke had partly cleared, I made a line fast round me and got into the hold, but still could see no traces of flames, but conclude it was in the body of the ship. At 5.30 a.m. we sighted the barque "Taria Topan," and bore down upon her and asked him to stop by me. I also sent a boat for the captain and got him on board and showed him the exact state we were in and agreed upon signals in case of us being compelled to obtain his assistance, intending in my own mind to try and get the ship into the Cape. The crew said that they would work with greater will if we steered so as to sight Tristan d'Acunha or the nearest land, and if the ship was then safe, they would do their utmost to get her into the Cape. This was agreed upon by myself and the captain of the barque. Every effort was made to get the fire under, but it was of no avail. At 2.30 p.m. the men said they saw no abatement; in fact, the fire was increasing, and they wanted to leave the ship, but I got them to try again with a will for one hour, and then I would see what was to be done (myself and the officers heaving coals overboard, trying, if possible, to get nearer to the fire, but we had to desist on account of the sulphur). At 3 p.m. the flames burst through the deck out of the starboard-chain-locker, quickly spreading all over. Seeing that no more could be done to save the property, and deeming it necessary for the preservation of life, I signalled the barque to close and gave the order to get the boats out and abandon the ship, which was effected by about 6 p.m., by which time the ship was in flames fore and aft. At about 8 p.m., as could be seen, there was only the mizzen-mast standing, and it on fire. At 10.30 p.m. the boats being secured, the captain filled on his vessel, the flames could be seen up to about 12.30 a.m., the barque going at the rate of nine knots per hour.

In concluding my evidence, I cannot omit to testify to Captain W. H. Hathorne, his officers and crew, my sincere gratitude for the aid and assistance they kindly lent me on the occasion, and for the hospitable and generous manner in which we were all treated whilst on board his vessel.

JOHN HENRY BUCKLER sworn:

52 years old; born in Sussex. I hold a certificate of competency as master. I have been nine years at sea, since last August. I have been four years as second mate and mate. I have been two years as chief mate of a vessel. Since last July I joined the ship "St. Mungo" at Dundee, a fortnight before she left; when we left Dundee, the vessel was in a tight, proper, and seaworthy condition. Nothing particular on the passage until the morning of the 13th September. Smoke was first seen on Saturday, 13th September, at 8.15 a.m. I was coming out at the cabin door after breakfast, the steward told me there was smoke coming out of the after-hatch ventilation, and I told him to tell the captain. The first thing the captain did, he went down the ventilator himself, ordered all the combustible stores to be removed, then battened tight down. In the afternoon I was sent to feel the hatches whether they were heated, and found them all cool, and in the dogwatch the captain ordered me to take off the cover of one of the ventilators on the poop. I took it off and kept it off until the captain told me to batten down again. During my first watch on deck I frequently felt the ventilators and hatches to see if they were getting heated, but found everything cool. At about 8 p.m., on Saturday the 13th, the men came aft and asked the captain to bear up for the vessel that was in sight. The captain answered that he had already done so. At midnight I was relieved by the second mate, and laid down in the after cabin, and about 3 a.m. (Sunday) I was awoke by a fearful explosion and rushed on deck, where I met the captain on the break of the poop; he was then giving orders to get the pumps and buckets under way. I went down on the main deck and looked after the work, set the men at the fire engine, force pump, and buckets. At about 4 a.m. the captain came on the main deck, and had a rope made fast round him and another small one in his hand, and went down each of the hatches, but had to come up soon on account of the smell of the gas, and when he returned he was almost exhausted. After the captain, I went down myself and could feel the heat of the coals in the main hatch, about 6 feet from the kelson. The captain ordered the carpenter to cut holes in the deck, to get the water down the better. Then at daylight on Sunday, 14th, we sighted a barque down to leeward; bore down to her, and proved to be the American barque "Taria Topan." Captain Broom hailed him and asked where he was bound to; he answered Mauritius; told him the ship was on fire and asked him to see him into the Cape. The captain of the "Taria Topan" said it was out of his course, but he would come on board. I was sent away in the boat for him; brought him on board; whilst on deck, and about to return on board his own ship, the men came aft and asked Captain Broom to steer for the nearest land, and asked the captain of the "Taria Topan" whether he intended to stay by them, as they said they could work with greater will. He told them he had agreed to do so. I swear that Captain Broom did all in his power to encourage the men and save the ship, but to no avail. When we started the boats at 3 p.m., the flames came up the chain pipes; the fire was spreading rapidly, notwithstanding the exertion of all hands at the pumps. The captain signalled the "Taria Topan" to close with him, and that he could do no more. About 6 p.m. the captain and myself left the "St. Mungo;" the flames were coming up all the hatches and spreading very fast; went on board the "Taria Topan." At night, about 10.30 p.m., the captain of the "Taria Topan" squared away; the "St. Mungo" presented one mass of flames. I wish to return our grateful thanks to Captain Hathorne, his officers and men, for the good treatment we all received whilst on board his vessel.

ALEXANDER SCOTT sworn:

30 years old; born at Dundee. Has been 18 years to sea. Has been 15 months as officer. Has been two months and a few days on board the ship "St. Mungo." I joined the "St. Mungo" after the cargo was on board. I was at the fore part of the after hatch when the smoke was seen. The steward was the first to see the smoke. The steward and I came aft, and the captain at the time coming out of the cabin door, we told him about the smoke. The first thing the captain did, he went down himself with the seaman William Robertson, to examine if there was any fire or heat to be found, but could not feel any. The captain ordered the stores to be removed on deck and hatches battened down. Everything was covered up. At 3 a.m. on Sunday, 14th, I was on the poop and heard an explosion in the main hatch, and I called all hands; captain came out and ordered all the hands to get the fire engine, force pump, and buckets ready, and commenced to throw water, pumping as hard as we were able, but found the fire gaining on us. At 5 a.m. I went aloft and looked for a vessel, and another man went up the mizzen rigging reported a vessel on the starboard quarter. The captain gave orders to square away down on her, which proved to be the American barque "Taria Topan," bound to the Mauritius. The captain spoke the vessel and reported to be on fire. Asked the captain to come on board which he did, and proposed staying by us to try to fetch the vessel to the nearest port, then the captain of the American barque returned to his vessel. The fire was gaining on us, and towards noon could hardly see on account of the smoke. The lower deck and the tank casing were on fire. We tried our best to extinguish the fire, but uselessly. The captain encouraged us, and did all in his power to save the ship. At about 4 p.m. the captain gave orders to haul the main sail and cross-jack up; the fire smoke being severe on our eyes, could not stop to obey the order. The captain gave orders to clear away the boats. The "Taria Topan" shortened sail and laid close to us to receive us on board. The captain ordered me in the first boat, with a note to the captain of the "Taria Topan" to tell him we could not stay longer, the fire was gaining so rapidly on us. The four boys, three men, and myself were ordered to go on board the "Taria Topan." Got alongside the vessel, put the boys on board and ship's chronometer, came back to our vessel to render any more assistance, brought back some provisions on board the "Taria Topan." Got orders to come back for a third trip; came alongside; flames were bursting out of the hatches. The long boat was sent away with part crew and provisions, but on account of the heavy sea and wind freshening, the captain gave me the orders to take the long boat in tow, but did not succeed on account of the heavy swell; got alongside the "Taria Topan," hooked our boat on to the hatches, took her on board, came on the poop of the "Taria Topan," discovered the flames flying up the mast and the rigging of the "St. Mungo;" it was 6 p.m. The "Taria Topan's" boat went back and fetched Captain Broom and the mate on board. After 10 p.m., the ship being in a mass of flames, took the glass; could only discern the mizzen mast standing and flames running out towards

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the bowsprit, and afterwards the "Taria Topan" squared away. We were well treated on board the American barque "Taria Topan," and I return my sincere thanks for the same.

WILLIAM ROSS, steward, GEORGE WILKIE, carpenter, CHARLES REILLY, A.B., JOHN MILLER, A.B., all on oath.

Swore to the correctness of the captain's entry in the official log-book, which was read to them, and on their being asked whether they were kindly treated on board the American barque "Taria Topan," they all said that they wished to express their gratefulness at the manner in which they were treated on board the said vessel.

Upon their being asked whether the captain and officers of their ship did everything in their power to save the vessel, they all answered in the affirmative.

Captain W. H. HATHORNE was called in:

I am the master of the American barque "Taria Topan" of Salem, Mass. At 5.30 a.m., on Sunday, the 14th September ultimo, I sighted the ship "St. Mungo" with signals of distress. I bore down upon her; went on board and found that the vessel was on fire. Agreed with the captain of the ship to remain by the vessel until such time as my assistance will be needed, but found, in spite of the efforts of the captain, officers, and men of the ship "St. Mungo," that the vessel could not be saved. I returned to my vessel. About 10.30 p.m., the ship "St Mungo" presented a mass of flames, the whole of the crew having come on board the "Taria Topan," (31 in all,) I continued my route to Mauritius, the port I was bound to, and arrived on Friday, the 17th October instant.

The Board thanked Captain W. H. Hathorne for his conduct on the occasion, and promised that he will be favourably mentioned in their Report to the Board of Trade.

Report.

The "Saint Mungo," of 1,375 tons register, was built of iron, under special superintendence, at Hull in 1865, and classed at Lloyds A1, 20 years. Her length was 223, breadth 36.5, depth 23.4; owned by Messrs. Gilmour, Rankin, & Co. of Glasgow; registered at the same port, and commanded by Mr. Frederick Broom, who holds a certificate of competency as master, No. 26,933. At the time of her abandonment she was on a voyage from Dundee to Point de Galle, with a cargo of 1,800 tons of coals. Her crew consisted of thirty hands, all told.

On Wednesday, the 9th July, at 5 p.m., she left the Tay, her voyage being prosperous up to Saturday, September the 13th, when, at 8.15 a.m., the steward, William Ross, saw smoke coming out of the after ventilator, and reported the same to the master, who was then at breakfast; he immediately went on deck and saw a slight issue of smoke from the whole of the ventilators, there being nine in number. He then ordered the combustible stores, such as tar, varnish, oil, &c., that were below, to be brought on deck; he, in the meantime, went below, accompanied by one of the crew, to see if he could discover the position of the fire, but the smell of the gas was so intense that they had great difficulty in regaining the deck. The captain and chief officer then went down the main hatch ventilator in the lower hold to see if the fire was on the skin, but found everything cool from the keelson up to about 6 feet; they concluded from this inspection that the fire was in the body of the vessel. The hatches and other openings were then ordered to be securely battened down, in hopes of smothering the fire, and after a time, the deck and hatches appearing cool, one of the ventilators was opened to allow the foul air, if any, to escape. After this precaution, the captain thought there was no fear of an explosion. At midnight there was no appearance of fire, but at 3 a.m., the fore, main, and after hatches blew off with a terrific explosion, the flame at the same time extending half-way up the mainmast, and dense volumes of smoke issuing from the whole of the hatches; immediately all hands were set to work drawing water and pumping with both force pumps down the main hatch; holes were also cut in the deck to allow the water to be poured freely over the burning cargo. At this critical time a vessel was sighted to leeward. The "St. Mungo" was then kept away and bore down on her. She proved to be the American barque "Taria Topan" from Boston, U.S., bound to this port with a general cargo. She was hailed and requested to remain by them, which the American captain readily promised to do. He then went on board the "Saint Mungo" and saw the exact state of the vessel. They agreed upon signals in case of immediate need, the captain still hoping to get his vessel into the Cape of Good Hope. The crew promised to do all in their power if the American barque would remain by them. Every exertion was made during the day to get the fire under, but without success. At 3 p.m. the fire burnt through the deck and rapidly spread over the vessel. Seeing that it was necessary for the preservation of life to abandon the vessel, the "Taria Topan" was then signalled to come near; the boats were then lowered and the vessel finally abandoned in lat. 35° 5′ S., long. 20° 40′ W. Table Bay, Cape of Good Hope, then bearing E. by N. ½ N., distance 2,060 miles. When the boats were in the act of leaving the ill-fated "Saint Mungo" a large ship passed close to but did not take the slightest notice of them, but held on her course to the S.E. Two days after the ship "A. L. Louis" of London, was spoken and told by Captain Hathorne that he had 30 men, the crew of an English ship, on board, and requested that as his vessel was small and having a long passage before him, that he would relieve him of part of the crew. In reply he cooly told him to put into the Cape and land them. It is unfortunately but too true that vessels in distress are frequently passed unnoticed by those in good condition.

Although it would appear, from the number of ventilators, that this ship was well and properly ventilated, but in reality she was not, as only three of the ventilators went to the bottom of the vessel, the others simply ventilating the between decks. The proper way to ventilate a vessel for coal is to have horizontal ventilators, running the length of the vessel under the between deck beams, and on the skin in the lower hold; those ventilators should be attached to the perpendicular ventilators from the deck. There can be no doubt that the explosion was due to the inflammable gases which had been accumulating among the coals and which the ventilators were unable to remove.

The Board, after hearing the evidence of the witnesses, which being the same in every respect, and was corroborated by Captain Hathorne, is of opinion that the abandonment of the "Saint Mungo" was necessary, and that the master, officers, and crew only adopted that measure when all chance of saving the property entrusted to their charge was entirely done away with; that no blame whatsoever can be attached to them, and have therefore much pleasure in returning the captain, chief, and second officers their certificates.

It now becomes the duty of the Board of recording the generous and hospitable treatment received by the master, officers, and crew of the "St. Mungo" from Captain W. H. Hathorne, of the American barque "Taria Topan" to whom honourable and ample testimony was borne. This is the second time in less than five weeks that British seamen have been rescued and brought to this port when in distress by vessels of other nations, the Board ventures to hope that the manly, honourable, and meritorious conduct of Captain William Hollingsworth Hathorne will meet with the favourable consideration of the Board of Trade.

JOHN MORGAN,
Acting Harbour Master, and
President of the Board.

JOHN COWIN,
A. W. BARCLAY, } Marine Surveyors.

J. A. ANDERSON,
Of the barque "Lorton Vale."

W. H. METCALF,
Of the ship "Beechardass Ambaidass."

"WAVERLEY," of Liverpool, of 999 tons register.

Inquiry held at Singapore; this 16th day of October 1873, into the loss of the British ship "Waverley," of Liverpool, official No. 45,453, 999 $\frac{7}{10}$ tons burthen, bound from Shields to Singapore with a full cargo of coals, before the Hon. J. W. W. Birch, Police Magistrate, and Messrs. E. M. Smith and H. Ellis, Nautical Assessors.

ROBERT CALVERT sworn, states:

I was master of the late British ship "Waverley," official No. 45,453. I left Shields on Friday, 27th June 1873, with a full cargo of coals, bound to Singapore. We proceeded all well until the 16th September, when we sighted the island of St. Paul's. On the following day we got a strong smell of gas. On examining we found neither smoke nor fire down below, but which we thought was caused by want of ventilation. On the 18th September, after removing the coals from the hatchway we found the smoke coming up, an explosion took place. We tried to put out the fire by battening down the hatches. The hatches were blown right off every two hours, and we found it impossible to batten them down. About 10 p.m. on the same day an explosion took place and blew the hatches up, and the flames reached nearly to the masthead; after which we hove to, put the boats out, and put provisions in them. On the following morning after daylight vast

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volumes of smoke issued from all hatchways, and we considered it time to leave the ship. We remained by her till she sunk the next morning, about 2 o'clock. We remained till sunset, when we were picked up by "President Van Ryckevorsel." I think the leaden pipes of the force pump got melted, and the water must have come in. On the 17th of September our position was, latitude 38° 23′ South and longitude 81° 37′ East; on 18th, latitude 38° 6′ South, and longitude 86° 45′ East; and on 19th, latitude 37° 39′ South, and longitude 88° 7′ East. On Saturday, the day we were picked up, our position was, latitude 37° 44′ South, and longitude 89° 34′ East. Our cargo was West Hartley coals. I had nothing whatever but coals which could have caused an explosion. When we left the ship it was blowing a strong breeze from north-west. Everything was quite correct three weeks before, when I had occasion to trim the coals. A fire occurred in the centre compartment, and it was impossible to get down here, as the coals were choked full to the top.

R. CALVERT,
Master, late ship "Waverley."

Before us,
J. W. W. BIRCH, President,
Police Magistrate.
E. M. SMITH, } Nautical Assessors.
H. ELLIS, }

WILLIAM COLE sworn, states:

I was mate of the late ship "Waverley." I hold a certificate of competency as master, No. 5,032, from the Board of Trade. I lost my certificate in the ship. The vessel was lost. On 17th September we perceived a slight smell of gas. On the 18th we discovered smoke coming up the ventilators. On the night of the 17th all was shut up; the water in the tanks was quite cool. About 10 a.m., 18th September, an explosion took place. I never saw explosions of that sort before. We got provisions on deck and secured the hatches. On the evening of the 18th, about 10 o'clock, a heavy explosion took place and blew the hatches off. We got the boats off, and at daylight on the 19th, at 5.30, we left the ship. The vessel went down about 2 o'clock on the morning of the 20th. I think the melting of the pipes and brass around must have caused the vessel to go down so soon. I lost my log-book. I believe the ship's papers were saved. The fire broke out in the centre compartment. It was impossible to get down there, as the coals were up to the beams. We did pour water down on the main hatch, but gave it up as useless. I never saw explosions like this before. The explosions were accompanied by a noise like a steam whistle. All hands were saved. We were to the eastward of St. Paul's about 500 miles.

WM. COLE,
First Mate, late ship "Waverley."

Before us,
J. W. W. BIRCH, President,
Police Magistrate.
E. M. SMITH, } Nautical Assessors.
H. ELLIS, }

PATRICK MIAGHA sworn, states:

I was second mate of the "Waverley." I have a certificate from the Board of Trade, No. 93,771, which I now produce. I recollect the day the gas commenced to escape, viz., on Wednesday, 17th September. We thought it might be foul air. At 6 a.m. the next morning we discovered the fire. Smoke was seen issuing from the ventilators, which I at once reported to the captain. I received orders to go down amongst the coals. I went to all parts of the ship I could get into, but found no signs of fire. In the afternoon we set to work to get provisions on deck, in order to batten down the hatches, thereby putting out the fire. We were prevented by the explosion, which blew off the hatches. We got the boats out during the night of the 18th, and at 5.30 a.m. on the 19th we took to the boats, but hung on to the ship. The vessel was hove to before we got the boats out. She was all in a flame; the masts fell, and she went down about two hours before daylight. A few hours before she went down the boats got parted. There was a heavy sea on. We were picked up the next evening. We poured water down the main hatch, but it did no good. The ventilators were taken down and the opening for them stopped up. At the latter part of the 18th the explosions became very frequent, and it was impossible to keep the hatches down. The explosion was something like the noise of steam passing through the safety valves. We sounded the pumps regularly all the way. I never saw the pumps used during the time I was in her. All was done to save the ship that could be done.

PATRICK MIAGHA,
Second Officer, late ship "Waverley."

Before us,
J. W. W. BIRCH, President,
Police Magistrate.
E. M. SMITH, } Nautical Assessors.
H. ELLIS, }

ROBERT PHILIP sworn, states:

I was carpenter of the "Waverley." I recollect the day she was lost. We first noticed the smoke issuing out of the ventilators. I examined it, but there was no sign of fire. I saw smoke coming out of the quarter hatch. The flame first showed itself that night at 10 p.m. I did sound the pumps, She did not make any water. The water in the tank was quite cool. The smoke came out of the after part of the main hatch. The hatches were battened down, but they were blown off by explosions. The explosions were not very strong. The one that went up the mainmast was like a rocket. I have been four years at sea. Everything was done to save the ship that could be done.

ROBERT PHILIP,
Carpenter, late ship "Waverley."

Before us,
J. W. W. BIRCH, President,
Police Magistrate.
E. M. SMITH, } Nautical Assessors.
H. ELLIS, }

HUGH HUGHES sworn, states:

I was boatswain of the late ship "Waverley." I recollect when the ship caught fire. We discovered the fire when we went down the after hatch. We got a slight smell of gas. The smoke was coming out from the centre compartment. After the smoke cleared away I went down, but did not go far, as the coal was chocked up to the beam. We put the hatches on, trying to smother the fire, but the explosions blew the hatches off. We had done all we could. We put some water down the after hatch, but it did not do much good. We left the ship at daybreak. It was not safe to stand by her any longer. The vessel burnt up, and in the morning we could not find her.

Questioned by the Master.

When I and some men went down to clear away the coals the smoke issued out. I did not stop there long.

HUGH HUGHES,
Boatswain, late ship "Waverley."

Before us,
J. W. W. BIRCH, President,
Police Magistrate.
E. M. SMITH, } Nautical Assessors.
H. ELLIS, }

We the undersigned seamen of the late ship "Waverley" consider that the burning of the ship was purely accidental, and everything was done that could be done.

HENRY WATT, apprentice.
JOHN HOWELL, A. B.
CHARLES × BROWN, A. B.
LOUIS OLSEN, his × mark, A. B.
FRANK MURRAY, his × mark, A. B.
RAYMOND H. COOPE, apprentice.
EDWARD BELL, apprentice.
RICHARD DOWMAN, apprentice.
JAMES LOW, A. B.
WM. JOHNSON, his × mark, A. B.
F. EARP, his × mark, cook.
J. GRACE, his × mark, A. B.
H. CARLSON, his × mark, A. B.
EDW. HARRISON, O. S.
OLOF, ANDERSON, A. B.
LOUIS PIERRE, his × mark, O. S.
AUG. BLOOM, his × mark, sailmaker.
WALTER S. FREEMAN, steward.

Decision.

The Court having inquired into the loss of the British ship "Waverley," of Liverpool, official number 45,453, finds that she was destroyed by fire at sea in or near lat. 37° 39′ S., long. 88° 7′ E.; that she foundered, and that all hands were saved. The Court considers that it would probably have been wiser to have used water a little more freely than appears to have been done; but looking to the weather and the situation of the ship so far from land, and to the constant explosions, they consider that no blame can properly attach to the master, and they are of opinion that

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his certificate should be returned to him, as well as to the first and second mates.

J. W. W. Birch, President,
Colonial Secretary and Police Magistrate.
E. M. Smith, H. Ellis, } Nautical Assessors.

Singapore, 16th October 1873.

"HERBERT GRAHAM," of Newport, Mon., wooden ship, of 337 tons register, six years old, classed A1, 13 years.

Town Hall, Newport, Tuesday, January 6th, 1874.

Coram:
Nelson Hewitson, Esq., Mayor,
Thomas Beynon, Esq.

Assisted by—
Captain H. Harris,
W. Parker, Engineer,
Mr. Darley, Shipwright, } Assessors.

Mr. Hamel appeared for the Board of Trade to conduct the case.

Inquiry as to the loss of the barque "Herbert Graham." Mr. Hamel opened the case.

Evan Roberts sworn, states:

I was late master of the "Herbert Graham," and held a certificate of competency as master, which certificate I lost during my travels in Patagonia. I joined the "Herbert Graham" on the 1st day of July last. She was laden, and ready to go out. We had a crew 10, all told. We had 536 tons of coal on board, and were bound for Valparaiso. I went into the hold several times on the voyage. In fore hold there was a large space between the coals and the deck, about 7 or 8 feet; the after hold was full. I never saw the vessel empty. We had a half-poop on deck rising 3 or 4 feet; the cabin occupied the whole of the poop. We ventilated the ship by means of the after and fore hatchways. These were continually kept open except in bad weather. The hatchways were, I think, about 8 by 6. We had fine weather all the voyage except for about 12 days off the River Plate, in the beginning of September. It was windy weather, which obliged us to close our hatches; so much water was going over that we were bound to close them. No complaints were made till the 19th of September by the crew of the gas. On that morning at eight bells the mate told me the watch had not come on deck. I went forward and saw three men lying on the forecastle floor unconscious. I could not get a word out of them. They had a stove fire in the forecastle at this time; it was cold weather. I got a rope and made it fast to the three men, and pulled up one at a time on to the deck and in about 20 minutes they came right and then they told me the forecastle was full of sulphur. I ordered the men to leave the forecastle, extinguish the fire, and clean it out. I sent them to a house in the break of the poop. The hatches fore and aft were open at this time. The men would not live in the house; it was too cold, they said, and they returned to the forecastle. This was the next day. I let them go. I heard no complaints. After that the forecastle was nicely cleared up, and they lighted the fire again. Nothing occurred till the 22nd of September. At 6 p.m. they reported (that is, one of the seamen did) that smoke was coming out of the fore hatch. Myself and the mate went to see what was the smoke, and we found very little, but ordered the hatches fore and aft to be battened down close; that was done, and in about an hour, more or less, they were opened again. When they were opened a second time the vessel was full of smoke, which cleared away in about 10 minutes. I went below to examine the hold, and found that the cargo of coal was on fire right amidships. I went on deck and ordered the vessel to be battened down close again, and changed the ship's course for the land. Smoke was escaping through the night from the tarpaulins on the hatchways, and the fore companion. Next morning my men were very anxious, and wanted me to put out the boats. At daylight in the morning (23 September) we erected two big davits, one on each quarter, to support the boats. It was not safe to leave them on the hatchways. They were put into the davits ready for lowering. In the morning continually the smoke was coming out from under the tarpaulins over the hatchways, and the deck was getting hot. At 9 a.m. we sighted the land, Port Santa Cruz, bearing W.N.W., distance about 35 miles. All sail, except the two royals, were set, and we were making for the land. At about 10 a.m. it became calm; then she had no way. It was a very fine day. I consulted with the mate, and we thought the best thing to do was to open the hatchways and discharge a part of the cargo. We opened them between 11 and 12 to see if we could extinguish the fire. When we did so we found the vessel was full of smoke; we could hardly breathe in it on deck. There was a smell of timber burning in the hold. The smoke all cleared away in about 10 or 15 minutes, when the fire burst out from the fore and main hatch. The boats were at once lowered, and the men went into them, except the mate, boatswain, and myself. We remained on her poop for about an hour and a half. We were looking at the flames coming up. I went on the main deck once or twice, and the pitch was boiling out of the seams, so that I could not remain there. The men remained in the boats by the ship. We three got in at about half-past 1 or 2 o'clock of the 23rd. When we left the ship the flames were ascending 4 or 5 feet above the main hatch. I did not go on board again. We saved most part of our clothes and effects, and the log books, but we lost them, the men left them in the long boat. We did not remain. The wind came off the land in the afternoon. We pulled for the land, and I saw her masts, fore and main, come down at about 5 o'clock that afternoon. She burnt up till 3 o'clock of the morning of the 24th September, and then disappeared. The ship on the voyage was very tight, made very little water, and was pumped out morning and evening in two or three minutes. We landed on the 26t about 25 miles N.W. of Cape Virgin on the coast of Patagonia. In landing one man fell overboard into the surf from the long boat. We picked him up again, but he afterwards died from the cold and exposure. His name was John Rowley, able seaman, a native of Quebec. We buried him on the beach under a cliff: he was a healthy man. We proceeded in the boats about 54 miles by the shore, and on the morning of the 6th of October a large steamer passed us. We signalled to her; she took no notice. I could see people on the deck. I don't know whether they saw us. It was about 9 o'clock in the morning. Seeing our provisions were getting short we started overland to Sandy Point. We started nine in number till we came to a river; five of us crossed, and the other four said they would go back to the boats; they went; I waited two hours; they would not come with us. In six days we reached Sandy Point, walking most of that time. We met some natives about a mile from that place. We were very kindly treated by the Governor of that place. We had nothing but water the last three days of our journey; previously we had six biscuits each. From Wednesday till Sunday, the 12th, we had no food. We left there on the following Tuesday in one of the Royal Pacific Mail Steamboats for Valparaiso, and from there we were sent to Liverpool in another steamer. I can give no opinion as to the cause of the fire.

(*By Mr. Graham.*) We had two chronometers on board.
[The Court decided that Mr. Graham had no *locus standi*.]
(*By Captain Harris.*) There never was much water in her.
(*By Mr. Darley.*) We had first-class iron pumps; 9 inches of water in the well; the delivery pump about 6 inches, fitted with breaks. We had double breaks but never fitted them, as we never had occasion to do so. We first discovered the fire under the main hatchway. I could not find the particular spot of the fire. I could not bear my hand in the coals 6 inches down on the 22nd September. We had no ventilation but the after and fore hatches. The ship was in fine trim, draught 16 aft and 15 forward.

Evan Roberts.

George Farrer sworn:

I was mate of the "Herbert Graham." I hold a certificate of competency as mate. I joined her on the 1st of July, same day as the captain, the day she left. Her cargo was in. On the Friday before we saw the smoke the men complained of gas. We had been 81 days at sea; the weather was very hot. On the 19th September saw the men lying on the forecastle floor, and I helped to pull them up; they were all right in about 20 minutes. I saw the smoke coming from the hatches we battened down. I went with the captain to inspect; we found the cargo very hot. We dug in as far as we could with our arms; we felt it the hottest about midships, where was the bulk of the cargo. The hatches were battened down till the day after we saw the smoke. At about midday the smoke overpowered us; shortly after the flames broke out. We lowered the boat and prepared to get to land, finding we could do no good. I and three others left the captain at the river; we returned to our boats, and seeing a steamer, the "Cuzco," we pulled to her. She took us on board, waited for us about half an hour, and landed us at Liverpool. I never smelled any gas from the coal. I could not smell sulphur. In the hold the smell caught our breath. It was the smell like the burning of oak timber. During the voyage we put no water down. We did not use shovels.

(*By Mr. Darley.*) When we first saw the smoke we did not think the coal was on fire. Our vessel had about 5 feet freeboard. Our pumps were fixed in.

G. Farrer.

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WILLIAM ROBERTS sworn:

I was an able seaman on board the "Herbert Graham." I joined her two or three days before she sailed. She was in the river at Newport. Cargo in. I lived in the forecastle. I was on deck and saw the men lying in the forecastle. Me and the captain went down. Smelt of gas; it made me sick. I could not stay long there. We got the men upon deck and cleared out clean of the forecastle. We returned to the forecastle, but did not smell the gas again till she caught fire. I thought it was the smell from the store. It was like a smell of sulphur; we could not remain in the forecastle. On Sunday night when the flames came up we left the forecastle, about 8.30, and battened everything down. We had to take to the boats.

(*By Captain Harris.*) The stove we had in the forecastle had a funnel through the deck.

his
WILLIAM × ROBERTS
mark.

WILLIAM JAMES sworn:

I was formerly master of the "Herbert Graham," and was formerly part owner of her. I joined her as master when she was on the stocks in the builder's yard at Scilly. She was on the stocks built when we bought her. On the 1st of July, the day she sailed, I gave up the command to Captain Roberts. I was by her when she was being loaded. She had discharged a cargo of iron ore from Spain. On the 20th of June, I took in stiffening about 70 tons, finishing on the 23rd June. This was in the lower Newport dock. We then went to the upper and took in the remainder of the cargo of coal. We were loading two days, Wednesday and Thursday. I told the trimmers to leave a space aft and forward, but fill her up midships at the main hatch. She left her loading berth on Friday, and we hauled her down to the lower dock again, near the lock. She remained there. I took in stores. I hauled her out into the lock of the dock on the 1st July, and then gave up the command. I had a cargo of coal on board this vessel once before. I weighed out then 139 tons in Japan. I had the same ventilation then as afterwards—the hatches; that is the only ventilation we had.

(*By Mr. Beynon.*) I think it was raining when we took in the stiffening. I never remember any cargo of house coals shipped at Newport taking fire before.

(*By the Mayor.*) With steam coal it is usual to have shutes as a means of ventilation, but this coal on board the "Herbert Graham" was house coal.

(*By Mr. Darley.*) I think the shutes are quite useless as ventilators. The "Herbert Graham" was insured for 4,000*l.* I value her at 4,800*l.* She was classed 13 years at Lloyds. No force pump was on board.

(*By Mr. Parker.*) We had no provision on board for extinguishing fire.

WM. JAMES.

THOMAS EDWARDS sworn, states:

I am a shipbuilder of St. Mary, Scilly. The "Herbert Graham" was built in my yard under a special survey of Lloyds. She was classed A1, 13 years. She was built of English oak frame and upper deck beams. Main keel English elm. I built her as a merchant vessel to carry cargo. She had three hatches on the main deck, air courses fore and aft, and under the hold beams was the ventilation. No ventilation shaft to the ship.

(*By Captain Harris.*) We always put chocks between the frames, but they are taken out before the vessel is planked.

(*By Mr. Darley.*) The ventilation is to prevent dry rot, and not for ventilating a cargo of coals. It was understood by Lloyds surveyor that the "Herbert Graham" was being built for a general cargo. All vessels that I have built generally take coal as a first cargo. I never heard of one taking fire before. Lloyds surveyor never called my attention to the importance of ventilation in the ship. I never heard of a valve or a cock to plug the vessel if required in the event of fire. I would recommend such a pipe to be fitted under water.

THOMAS EDWARDS.

JAMES BARBER sworn, states:

I am foreman coal-shipper under Messrs. Webb, Spittle, and Bladon. They supplied the coal to the "Herbert Graham." I superintended the shipping of the coal. I saw the stiffening put in. The loading of that began on the Saturday. It was put in in the old dock, laden in the open, not under cover; it was brought in trucks. We put about 10 trucks (50 or 60 tons) on the Saturday, seven trucks being left; they stood outside. It rained on the Saturday while the stiffening was being put on board, and it rained up till midnight on the Saturday night. The men knocked off work because of the rain. On Monday morning it was dry, and the men got to work again, and put in the seven trucks that had been left out. Then the ship went to the other dock to take in the remainder of her cargo. I superintended the shipping of that. The cargo was dry. It came direct from the colliery in trucks. The first lot came on Monday morning, and more coal arrived till she was filled up; it was perfectly dry weather while she was loading her cargo. I was in the hold twice or three times while she was loading; I was not in the hold after the cargo was completed. The coal shipped was of three different qualities. The stiffening was all brush coal; it came principally from the Mamhole Colliery; brush coal is next to large in quality. Small coal came from Coalbrooke Vale and some from Cwmserchan. The large coal was from Cwm Colliery at Aberbeeg. I can tell the coal one from each other on seeing them. The two pieces produced are Cwm Coal. This piece is the Crumlin coal from Pant Glas Colliery. Most of the coal put on board was brush coal. I do not know the quantity of Cwm coal put on board. The piece of coal now produced with a stain upon it is Crumlin coal from a lower vein from that we work at present. The customers did not like the stain in it, and therefore, we work the other. The stiffening was a mixture of small and round coal.

JAMES BARBER.

PATRICK DONOVAN sworn, states:

I am a coal trimmer. I trimmed the coals on board the "Herbert Graham," and helped to stow them; the coal was dry and I could see no fault in it. It was fine as we loaded, could not be finer. I trimmed her all right. She was full in the main hatch and after hatch, but not forward. I was not present when the stiffening was put in.

his
PATRICK × DONOVAN.
mark.

WILLIAM KIRTON QUEST sworn, states:

I am deputy dockmaster of the Newport Dock Company. We keep a record of the wind, &c. The weather was fine during the last week of June and up to the 3rd of July. I know it was raining when they took in the stiffening of the "Herbert Graham." I was going past, and the tarpaulins not being properly placed to prevent coal falling into the dock, I complained to them about it, and I distinctly remember it was raining hard at the time. When she left the locks she was reported 16 feet draught of water.

W. K. QUEST.

ADOLPH PIERRE VASSARD sworn, states:

I am a consulting chemist in London. I have had submitted to me some samples of coal similar to that carried by the "Herbert Graham," and I have analysed them. The result of my analysis is contained in the written report produced.

Report read as follows:—

Re "Herbert Graham."

A sample of the coal carried by this ship at the time she was burnt sent to me under the seal of "Searchers Customs, Newport," has been analysed and otherwise examined by me according to instructions. I found the coal highly pyriteous and very brittle.

It contains per 100 parts—

Moisture - - -	0·35
Hydrogen and nitrogen - -	9·10
Carbon - - -	81·00
Mineral ash - - -	5·40
Iron pyrites - - -	3·04
Divers and loss - - -	1·11
	100·00

Though the sample I received was in three lumps, I am warranted, considering the general practice of the coal trade with the Pacific Coast and the brittleness of the coal under examination, to say that it was shipped small, or became such by the loading. Small coal absorbs easily any amount of moisture.

The quantity of iron pyrites is very large. Iron pyrites are a bisulphuret of iron, that is to say, a compound of iron and sulphur. Over three per cent. of iron pyrites, as shown by analysis, would give, if allowed to naturally decompose, nearly one per cent. of free sulphur. To the presence of so

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large a quantity of pyrites I attribute the burning of the 'Herbert Graham."

When bisulphuret of iron or iron pyrites is left when wet to the action of the air, or to the action of a moist atmosphere, it gradually undergoes a chemical change; one part of the sulphur is oxidised partly by the *oxygen* of the air and partly by *that* of the decomposing *water*, and becomes *sulphuric acid*. Thereby the other part of the sulphur is disengaged from the pyrites, and also hydrogen from the water. This sulphur and the then free hydrogen are thus thrown in presence of each other, combine, and form *hydrosulphuric acid* or *sulphuretted hydrogen*.

These chemical reactions produce a great heat, whereby the sulphuretted hydrogen is ignited and therefore oxidised, producing *sulphurous acid* and *free sulphur*, which is also ultimately burned.

It may then be easily understood that if a combustible material like coal, disengaging already inflammable gases through its continually going on decay, is found mixed with the chemical bodies producing the above reactions and effects, this combustible will be heated and ultimately ignited.

Such is the chemical explanation of what is called "spontaneous combustion," and of what undoubtedly took place in the hold of the "Herbert Graham."

If the coal had been shipped completely dry, and so kept all the while, no spontaneous combustion could happen.

A. VASSARD.

I was present in court during the examination of the witnesses, and I heard Mr. Barber, the foreman coal shipper, state the different kinds of coal shipped on board the "Herbert Graham." I have no doubt that the stiffening about 70 tons of coal put in during wet weather would moisten the whole cargo in any circumstances; in three or four days it would moisten the cargo. It further appears that the whole of the cargo was shipped direct from the colliery, and would contain a large quantity of moisture, more than three per cent. It is the same with all coal except large coal. Three per cent. of water would be sufficient in time to ignite the cargo if the coal remained in bulk undisturbed, and would ultimately take fire. There is no danger with large coal, but with small coal there is. I think the chemical composition of the coal explains the fire on board the "Herbert Graham." About half a ton of sulphur would produce a sufficient quantity of sulphurous acid to extinguish a fire in 1,000 tons of coal on board ship. To apply this a pipe would have to be fitted to the ship and carried under the cargo. I would have a small stove on deck, and when a fire has been lighted in it throw sulphur on the fire. Sulphurous acid would then arise and be carried down the pipe attached to the stove into the vessel's hold. In five or ten minutes that would extinguish the fire. Even if the pipe was containing a little water the acid would still escape. It would not be necessary to have the hatches down when the process is going on. The sulphurous acid is twice as heavy as air. A small air pump might be necessary to force the sulphurous acid through the water covering the pipe. The acid would not be dangerous to life, through being oxidised before reaching the deck. I doubt whether ventilating the cargo with shafts when loading would have any effect unless the coal was shipped perfectly dry. I don't think the shafts are of any use except to prevent the explosion of gas. If water was used to extinguish the fire, the cargo would have to be covered all at once; a small quantity would be of no use; this would facilitate combustion. Captains of ships ought to be provided with thermometers, and when they find the coal is heating the application of sulphurous acid would check further combustion. The sulphuretted hydrogen produced by the decomposition of the pyrites would ignite between 170° and 173° Fahr. The ordinary temperature even down to freezing point is sufficient to make the pyrites decompose, providing water and air be present. I mixed the whole five samples of coal from the "Herbert Graham" together, and on analysis found the mixture contained over three per cent. of pyrites. I should not be surprised if one of the samples contained as much as 10 per cent. of pyrites. I do not think washing the coal would have prevented ignition. The washing of coal is based on the difference of specific gravity between iron pyrites and coal, and can only be applied to small coal. I never saw it done. I never heard of it till lately. The pyrites will take fire sooner if the temperature is warm.

By Mr. Darley.—Can you explain why the introduction of wood trunks and louvre boards amidships placed against the stanchions and other means of ventilation produce a good effect,—produce a good effect in one case and are injurious in another?

Answer.—All depends on the nature of the coal; with coal containing no pyrites, therefore not liable to spontaneously ignite, ventilation has a good effect in carrying away the gas, but the contrary is the case with coal containing pyrites, and therefore liable to spontaneous combustion. In the last case a good reason can only be possible if the coal is shipped dry and so kept all the voyage. I think testing tubes should be fitted to ascertain the temperature of the coal, which should be ascertained every day. I think if testing tubes had been fitted on board the "Herbert Graham," they might have ascertained the existence of fire earlier and discharged the cargo. Testing tubes could not be used to send the gas down. It would be better that coals should not be shipped direct from the pit; but this would be quite impossible.

A. VASSARD.

Report.

Report of a Court of Inquiry held at the Town Hall in Newport, Monmouthshire, by order of the Board of Trade, before Nelson Hewertson, Esq., Mayor, and Thomas Benyon, Esq., J.P., with Captain Harris as Nautical, and Messrs. Parker and Darley as Engineer and Shipwright Assessors, into the circumstances attending the burning of the barque "Herbert Graham," which occurred on the morning of the 24th day of September last, near the entrance of the Straits of Magellan.

The "Herbert Graham" was a barque, built of wood at St. Mary's Scilly, in the year 1869, and registered at this port in the same year, of the burden of 337$\frac{69}{94}$ tons. She was owned by Robert Graham and others of this port, and on this present voyage was commanded by Mr. Evan Roberts, who held a certificate of competency as master, which was lost after the destruction of the ship. The "Herbert Graham" left Newport on the first of July 1873, manned by a crew of 10 hands all told. She was laden with a cargo of 536 tons of coal, bound for Valparaiso. Nothing worthy of remark occurred till the 19th of September, when three of the crew were found in the forecastle in a state of stupor. They were removed to the upper deck, when in about 20 minutes they recovered their senses, and stated that the forecastle was full of sulphur, which they attributed to the presence of a close stove which was allowed in the forecastle, the weather then being very cold. They were removed to a house aft, and the fire in the stove put out. The following day they returned to the forecastle, and no further complaints were heard. On the morning of the 22d smoke was discovered issuing from the fore hatch, which was battened down. In about an hour the hatch was taken off, and it was discovered that the ship was full of smoke, which, clearing off in about 10 minutes, enabled the master to go into the hold. Upon descending he found that the cargo was on fire amidships. All the hatches were closely battened down, and the ship's course directed towards the land. The following morning they sighted the land in the vicinity of Port Santa Cruz, but falling calm, after consultation it was decided to open the hatches and throw overboard part of the cargo, in the hopes of reaching the fire. In about 10 minutes after the hatches had been taken off flames burst up from both fore and main holds. In this state of things, and being powerless to control the flames, the crew were sent into the boats, the master, mate, and boatswain remaining on board till 2 p.m. of the 23rd, when, for their own safety, they were obliged to abandon the vessel and pull towards the shore. At 3 a.m. on the following day they saw the vessel disappear. On the 26th they landed near Cape Virgin, on the coast of Patagonia. In landing one of the crew fell overboard from the effects of which and exposure on shore he died, and was there interred. From this they proceeded in their boats about 50 miles up the Straits of Magellan, but finding the wind against them, and their provisions getting low, they determined to walk to Sandy Point, a penal settlement of the Chilian Government. Five of the crew accomplished this after great suffering from exposure and hunger, and were kindly treated by the authorities at Sandy Point, who forwarded them home. The other four who separated from their companions preferred proceeding along the coast in their boat, and falling in with a passing steamer, were taken on board and conveyed to England. The captain and his crew seemed to have done all in their power, under the circumstances in which they were placed, and only abandoned the ship for the preservation of their lives. The main object of this inquiry was to ascertain the cause of this casualty, and, if possible, to devise some means of preventing similar accidents in future. From the evidence it would appear that five different descriptions of coal, taken from the vicinity of Newport, were shipped on board the "Herbert Graham." About 70 tons of this coal was put on board as ballast in rainy weather, and the vessel was removed to another dock to complete her cargo, during which time the weather was fine. These coals were brought

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direct from the colliery, and would therefore be more or less damp, according to the evidence of M. Vassard, who was examined as an expert on this inquiry. This gentleman analysed three samples of coal, similar to that forming part of the cargo of "Herbert Graham," and found that they contained three per cent. of iron pyrites, which would decompose through moisture and exposure to the atmosphere, and thus become sulphate of iron and sulphuretted hydrogen. This sulphuretted hydrogen, under the influence of the heat produced by the above reaction and the atmosphere, would ignite and cause spontaneous combustion. And these coals having been shipped in a moist state, and containing a large amount of pyrites, would, in his opinion, be alone sufficient to account for this casualty. With these facts before us, it becomes necessary, if possible, to seek some means of prevention. Several plans were discussed by means of ventilation on the one hand and of water on the other. It was found, however, upon investigation, that in accordance with the above hypothesis the introduction of either water or air would have a precisely opposite effect. It further appeared, from the evidence of M. Vassard, that if sulphurous acid could be circulated through the cargo it would prevent spontaneous ignition. This acid could be obtained by burning sulphur, 10 cwt. of which would be sufficient for a cargo of 1,000 tons of coal. It is a matter of after consideration how this may be applied, either on the principle of the fire annihilator or otherwise. This method seemed the most practical that was offered, and, in the opinion of the Court, might be usefully applied to vessels carrying coals and bound on distant voyages. In offering this opinion, however, the Court desire it to be understood that they do not consider the general question exhausted with reference to the preventing the recurrence of casualties of this description.

Given under our hands this 8th day of January 1874.

NELSON HEWERTSON,
THOS. BEYNON,
Justices of the Peace.

We concur in this report—

HY. HARRIS,
WM. DARLEY,
WM. PARKER,
Assessors.

"MINNIE GRAHAM," of Newport (Mon.), barque of 273 tons register, five years old.

Town Hall, Newport (Mon.),
Friday, March 13th, 1874.

Coram:

NELSON HEWERTSON, Esq., Mayor.
THOMAS BEYNON, Esq.

Assisted by:

Captain HARRIS, and FINTON WAKE, Esq. } Nautical assessors.

Inquiry directed by the Board of Trade as to the circumstances attending the abandonment of the "Minnie Graham."

Mr. Hamel appeared for the Board of Trade to conduct the case.

Case opened by him, and calls—

ROBERT BALE sworn, states:

I am a seaman, and shipped as boatswain acting second mate on board the "Minnie Graham." I shipped on the 16th July, and sailed the 17th from Newport. We had a crew of ten all told and a full cargo of coals. I noticed the coal was shipped wet. I saw a few trucks that was wet. It was mixed coal, large and small. We were bound for Valparaiso. We had two main pumps on board abaft the main mast. We had four small ventilators coming through the mooring post. They were cast iron and came through the covering board. I could get my arm into them. They went straight up and down, and could be plugged at the top. The plugs were out when it was fine weather and put in when it was rough. We had three good sized hatches, ordinary size; they were always off on the voyage when the weather permitted. Not the main hatch but the fore and aft ones. Always a wash of water across the main hatch; that was not so in fine weather. We never raised the main hatch in fine weather. We had a long boat shipped across the main hatch, and it was a good deal of trouble to get off. We had fine weather till we got off the Plate. She rolled easily. The wash I refer to came over the covering board. I believe the mate saved the log-book. Three or four days before we first saw smoke there was a strong smell of gas in the forecastle and also in the cabin. Nothing happened before this. We had an average voyage. The escape of gas was reported to the captain. He came to see what was the matter. He went into the forecabin and also in the hold. After that the hatches which had been opened were battened down. It was cold weather at the time. We were the other side of Cape Horn at the time. We were not in sight of land. Soon after the hatches were battened down we could not stay in the forecastle for smoke. The hatches were kept on till we saw the ship that took us off. It might be four days. The ship was the "Naval Reserve." We signalled her. She put out her boats, came alongside. Our boat was taken off the hatches after she boarded us. We had two boats. The small one was got out before the "Naval Reserve" boarded us. We had not provisioned the boats. The captain and carpenter of that ship came on board. They passed a survey on the ship and the main hatches were taken off. I dug away the coal under the main hatchway by direction of the two masters. We found the coal so hot just below the surface that I could hardly hold it in my hand. I dug down about two feet. Smoke was coming up as much as I could bear. The iron stanchions from the deck beam to the hold were hot, very hot; it was as much as I could do to hold them. The captain was down in the main hold and in the fore hold. I went into the fore hold and found the coals there just the same. I saw no fire. I poured in four or five buckets of water into the hole that I dug under the main hatch, but it would not penetrate, it stopped on the top. I did this to see if any steam would come up. Our captain, the captain of the "Naval Reserve," and the carpenter held a consultation (our mate was sick in bed), and they determined it was not safe to remain on board. We could not tell but what in any minute she might blow up. The ship was abandoned by us all. The carpenter of the "Naval Reserve" bored a hole just underneath the cabin deck to sink her. We were taken off in the "Naval Reserve" boats. I left in our own little boats; it was fine weather. I saved some of my clothes, just as much as I could scramble up. It was not safe to take a light below. It was in the evening when we left. Our long boat got stove. Our small boat was got on to the "Naval Reserve's" deck. It was fine weather, with whole sail breeze. I don't know how the wind was. She had not gone down about 10 o'clock that night. It was about 8 when we got the boats in. The "Naval Reserve" landed us at Callao.

We could not see land when we abandoned our ship. We altered the ship's course a point or two in towards the land before we saw the "Naval Reserve."

(*By Captain Harris.*) I think we had observed the smell of gas three or four days before we saw smoke.

(*By the Mayor.*) About four days after we saw the smoke we abandoned the ship. It was, I think, about eight days after we first smelt gas that we left her.

(*By Captain Harris.*) Our forecastle was close bulkheaded and the smoke came through the nicks. When under the line we felt no heat from the cargo. We went right round the Horn. The mate stopped at Callao; he had been ill a few days. During the voyage I am sure no water was thrown down into the hold.

(*By the Master of the Minnie Graham.*) You went off in the small boat to fetch the master of the "Naval Reserve," and the captain and carpenter of that vessel returned with you? —The captain of the "Naval Reserve" considered it unsafe to remain on board; he returned in our boat and sent his own life-boat to our assistance.

his
ROBERT × BALE.
mark.

EDWIN ELLIOT sworn, states:

I was cook and steward of the "Minnie Graham" on her last voyage. I joined her at Newport on the 16th, and she sailed on the 17th July last. I lived in the house on deck. I did not see the cargo shipped. On the voyage the fore and aft hatches were generally kept off in fine weather, that is, left off by day, we put them on at night; the four ventilators which were right aft and led on through the lazarette in the hold were metal pipes (I think lead), were kept open day and night in fine weather. In the month of October, four or five days before we left the ship, we smelt a strong smell of gas in the forecastle; the hatches had been off the day before; they were immediately taken off again; we then saw smoke, it came up in small curls at first; it gradually increased. The captain was called to see it; the men said they could not live in the forecastle; he went into the fore and after hold. I think the hatches were battened down after this till the Saturday before we left her. I suffered from the gas; I was ill from it; it laid me up. It came into the deck-house through the lazarette house just inside the door; I was bad all day, and could not observe what was going on. We caulked the lazarette-hatch down, and slept that

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night in the house as usual. We were rescued on Sunday. I was a little better that morning, but cannot say what happened. We saw the "Naval Reserve" just after dinner. The eboats were being got ready when she hove in sight with a view to abandoning the ship. We signalled her, and as soon as she got alongside our captain went on board in his jolly boat, and brought back the captain of the "Naval Reserve" and the carpenter; they examined our ship, took off the hatches, and smoke arose, a good deal, and gas. I saw Bale put several buckets of water down the hold. The captain of the "Naval Reserve" said it was not safe to remain on board; he was on board about a quarter of an hour before he said this. We were all called aft and asked what we thought we had better do. We said we had better leave her. He said it was not safe to remain on board as we did not know the moment she might blow up. The captain and carpenter returned to their ship and sent their life-boat to take us off. I saw the carpenter of the "Naval Reserve" go below into the lazarette with an augur in his hand, and I was told he bored a hole in her. One of the crew said so. The gas that made me ill appeared to smell like paraffin; it made me giddy and sick. I could not eat nor lift my head up. It made me rather short of breath and cough a good deal. I lost best part of my clothes. I was too ill to pick them up. We used an oil lamp in the deck-house.

EDWIN ELLIOTT.

GEORGE HARDY sworn, states:

I was an able seaman of the "Minnie Graham." I joined her the day before she sailed at Newport. I had been five years in a pilot boat, and this was my second foreign voyage. I lived in the forecastle. About three days before we left her (we left her on Sunday, the 26th of October), I noticed gas and smoke in the forecastle. It smelled like paraffin upset. It got worse and worse; it drove us on deck the night before we left her. There was no heat, but the forecastle got full of smoke. We could see it. It was reported to the captain, and he searched in the hold. He was driven back. Then we battened down the aft hatch, but the fore hatch was kept open, and the smoke escaped through it. The smoke got worse. We knew the ship was on fire; the stanchions were hot. So on Sunday we got the boats ready in the morning before the "Naval Reserve" hove in sight. We signalled to her, the ensign union down. She came to our assistance, and the captain and carpenter came on board, examined our ship, and we were called aft, and the captain of the "Naval Reserve" asked our opinion. We said we thought the ship was on fire. He said the same and we had best abandon her, as she might blow up or break out on us, and so we all left her. I saved most of my clothes; I went down into the forecastle for them. It was not quite so thick but what I could see my way to find them. We had thoughts of abandoning her before we saw the "Naval Reserve." We worked the pumps during the voyage. It took about five minutes to pump her out with one pump. The pumps were not choked. We were never more than 10 minutes at the pumps, and that was after a breeze.

GEORGE HARDY.

WILLIAM THOMPSON sworn, states:

I am an able seaman of the "Minnie Graham." I was the first to discover smoke on board. It was in the forecastle. When I got up in the morning I could hardly breathe. It was about eight bells. My head was like to split. I found gas and smoke in the forecastle. It smelt like paraffin. I reported this to the captain. I was at the wheel at the time. I went to the hold the second and third day after, and dug about two feet into the coals, and found plenty of gas and smoke to choke me. I came away, fearing I would be blown up altogether. We prepared to leave the vessel before we saw the "Naval Reserve." This was the third day after, (Sunday morning). That day was the first day the main hatch was taken off. The captain and carpenter of the "Naval Reserve" came on board, but I don't know what they did, as I was busy. The end of it all was we left her. We were called aft and our captain spoke to us. He asked what we thought of it. We said the ship was not in such a condition as we could remain on board of her. I was in the small boat which brought the captain and carpenter of the "Naval Reserve" to our ship, and remained in the boat. I have been 12 months at sea, foreign, having previously served five years' apprenticeship in a pilot boat.

By Captain Evans.

I made a mistake. Both captains were there when we were called aft.

WILLIAM THOMPSON.

WILLIAM COLLINS sworn, states:

I am a stevedore, and was in the hold helping to load the "Minnie Graham" with her cargo of coal. It was in the beginning of July last. I was with her the whole time she was loading. She had no stiffening on board; she did not want it. We put in small coal at first, slack; it was quite wet when we put in. It adhered to the trucks, it was so wet. We began with small wet coal. We put in perhaps about 40 or 50 tons of this, and then commenced with large coal. That was wet also. It was heavy rain the previous night, and the trucks were standing in it. I was paid for the cargo, 400 and some odd tons. She was full amidships. There was a good deal of room left fore and aft. We could have got 70 or 80 more tons in her. We were told not to let the coal go too far aft upon some wood, very inflammable. If you put a candle to it or against the side of the ship, it caught fire.

his
WILLIAM × COLLINS.
mark.

TOM JONES sworn, states:

I am traffic manager for Messrs. Powell. Coals from their two pits were put on board the "Minnie Graham." The cargo consisted of 60 tons 3 cwt. of Hope large coal, 20 tons 6 cwt. of Hope brush, 323 tons 1 cwt. of Tyrfilkin brush coal. No slack was mixed with the brush coal. The coal was fresh worked from the colliery when it was shipped. Some of the coal was in the waggons before being shipped 48 hours. That lot was 49 tons 9 cwt. The next lot was 91 tons 1 cwt. in the trucks, 30 hours; next lot 85 tons 8 cwt., in the trucks 24 hours; and 60 tons, in the trucks 24 hours; next lot 54 tons 11 cwt., in the trucks 54 hours; and next 59 tons 11 cwt., in the trucks 30 hours. When we commenced to load the vessel it was dry weather. Part of the cargo was out on Sunday and shipped Monday morning. The dates of the shipping were 11th, 12th, 14th, and 15th of July. The piece of coal produced I believe is Hope coal.

TOM JONES.

Adjourned till to-morrow morning, at 9 o'clock.

JOHN COOK sworn:

I am a shipbuilder. I have built many ships. With regard to ventilation, I believe there should be trunks laid fore and aft and ventilators up to the deck, trunks like a shoot. I produce a sketch I have made. (*The Court examined the sketch, and witness pointed out how the trunks should be placed.*)

JOHN COOKE,
Shipbuilder.

The Captain WILLIAM EVANS here put in his written statement.

ALFRED EDWARD HAYNES sworn, states:

I am a master mariner. I have commanded ships engaged in the coal trade. I have shipped coal at Swansea three times. I have had ships on fire from spontaneous combustion, one of the ships, the "Golondrina," took fire about 500 miles on the other side of Cape Horn. Her cargo was 630 tons of coal; it was mixed coal shipped dry; it was dry weather when shipped. I tried to extinguish the fire by boring a hole down below in the runnels and letting in water. I let in six feet. I then pumped her out after plugging the hole. I then put her on the other tack and let the same quantity of water into her and pumped her out again, opened all the hatches and found no fire only steam. At 4 o'clock next morning I saw fire coming out of her side in the upper works. We then prepared to leave her, and had to leave her. We had ventilators on board fore and aft on each side of the kelson, also in the bilges, and two up and down to the main hatch, two to the fore hatch, and one to the after hatch.

The other two ships were about the same tonnage. The "Corridora" carried a similar cargo shipped in dry weather; she was ventilated in the same way, and after 60 days out from Swansea, Cape Horn distant about 60 miles E.N.E., I discovered smoke coming up through the ventilators. We opened all the hatches and dug down as far as we could and found the seat of fire; heat increased till we got down and we found a calcined mass of white cinder-like lime. Smoke came from the hatches before we opened them. We found this seat of the fire near the bottom of the cargo. In 14 or 15 days afterwards the same ship took fire again from the same cargo. My men were brought out of the forecastle on to the decks in a state of insensibility. I went forward with my chief officer and found fire in the cargo near the foremast. I saw it

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through the platform boards. We dug down the fore hatch and got to the fire; it was right at the bottom of the hold on the platform about four feet from the ship's bottom; the fire extended eight or nine feet forward. We found a large mass of red hot coke, applied water to it, and put it out from our fire engine. We had 17 hands, all told, on board. Since this, we have altered the mode of ventilation. We now have trunk boards placed right fore and aft on each side of the midships stanchion, right up from the kelson to the decks. We also take the platform boards and put them on the 'tween deck beams. This leaves a width of 4 inches of ventilation right through the centre of the ship making as it were four separate cargoes. We are particular in taking in the coal dry, we would not ship it wet.

A. E. HAYNES.

DAVID PRICE sworn, states:

I am a master mariner and shipowner. I have shipped and carried cargoes of coal a great many times, principally from Newport. I never shipped smelting coal for the west coast. Always carried steam coal.

D. PRICE.

The following is the evidence given by M. Vassard to which the Court referred:—

ADOLPH VASSARD sworn, states—

I am an analytical chemist, and have examined three specimens of coal carried by the "Minnie Graham," No. 1 from the Hope Colliery, No. 2 Tyr Filkin, No. 3 small coal and coal dust. No. 1 is very brittle, and it shows two veins of iron pyrites, each vein measuring about a quarter of an inch, that is, half an inch in 4 inches of coal. It contains by weight three per cent. of iron pyrites, equal to 1·60 of sulphur. It absorbs water easily, 2 per cent. in five minutes. There is no binding power between the coal and the pyrites, so that the water passes through like a sieve. It contains 40 per cent. of volatile matter (gas and sulphur). No. 2 sample. This coal (Tyr Filkin) is more sulphurous than No. 1, the pyrites completely permeate the entire mass, which is a mass of sulphur. This is more porous than the Hope Colliery coal; this absorbs 2·8 per cent. It contains 5·25 of pyrites, being equal to 2·80 of sulphur, volatile matter being 49 per cent., including sulphur. No. 3 sample, small coal and dust, contains 6 per cent. of pyrites, which gives 3·2 of sulphur per cent. It emits only 37 per cent. of volatile matter, including sulphur. It contains also a large quantity of aluminous shale amounting to 6½ per cent. Shale would absorb a large quantity of water easily, which makes the coal dust adhere like mortar. Besides that the presence of shale facilitates the accomposition of pyrites to a great extent, on account of its great absorbent power. I have already given my theory in the case of the "Herbert Graham," on a previous inquiry, and am still of the same opinion as to the means to be adopted by ships carrying cargoes of coal.

From the evidence I have heard yesterday, I am of opinion that, considering the nature of the cargo of the "Minnie Graham," and the wet state in which it was shipped, no system of ventilation would prevent the cargo taking fire, and I am surprised that she did not take fire before. If coal was shipped in casks tight the coal would not ignite.

I produce slips of a letter sent by me to the Mining Journal on the subject of coal cargoes, expressing my view on the subject pretty fully.

With a cargo like that of the "Minnie Graham," spontaneous combustion is a mere question of time. Ventilation of heaps of coal exposed to the atmosphere is very efficacious. Ventilation of coal on board ship would be useless for want of proper circulation of air.

Report of a court of inquiry, held at the Townhall, in the borough of Newport, Monmouthshire, by order of the Board of Trade, before Nelson Hewertson, Esquire, Mayor of Newport, and Thomas Beynon, Esquire, J.P., assisted by Captain Harris, and Fenton Wake, Esquire, into the circumstances attending the burning and subsequent abandonment of the barque "Minnie Graham," which occurred on the 26th day of October 1873, in the South Pacific Ocean.

The "Minnie Graham" was built at Cremyl, in the county of Cornwall, in the year 1868, and registered at Newport, Monmouthshire, in the same year, 273 tons. She was owned by Mr. Robert Graham and others, of this port, and on this present voyage commanded by Mr. William Evans, who holds a certificate of competency dated 1867. The "Minnie Graham" left Newport on July 17th, 1873, manned by a crew of 10 hands, all told, and laden with a cargo of 414 tons, consisting of three qualities of Newport coal, all shipped in a very wet condition. Early on the 22nd of October a strong smell of gas was perceived coming up in the forecastle and the cabin aft. The hatches were opened, and the following day smoke was seen issuing from the fore and after hatchways. The long boat was removed from over the main hatchways, and upon digging down the coal was found to be greatly heated, and the iron stanchions extremely hot. Finding nothing could be done to extinguish the fire, the hatches were put on, and preparations were made on the 26th to abandon the ship, being then 700 miles or thereabouts from the port of Valdivia. On the afternoon of that day a vessel, the "Naval Reserve," of Liverpool, hove in sight, the master and carpenter of which came on board, and after taking the hatches off and examining the cargo, advised the abandonment of the ship. Accordingly a hole was bored in the run, by the advice of the master of the "Naval Reserve," in consultation with the master of the "Minnie Graham," and his chief mate; and the whole crew, with provisions and part of their effects, were taken on board of the former ship, and all landed at Callao. The loss of the vessel by spontaneous combustion was very similar to that of her sister ship, the "Herbert Graham," the coals in both instances having been shipped in a very wet condition. It must, however, be observed that there was more slack, or small smelting coal, on board of the "Minnie Graham" than in the former vessel, which, according to the evidence of Mr. Vassard, the analytical chemist, was more liable to produce spontaneous combustion. The time in which this took place was very nearly the same in both vessels. An analysis of the three qualities of coal shipped on board of this vessel showed that they were all of a very inflammable nature, containing large amounts of iron pyrites, the details of which will be found in the evidence. The Court then addressed itself to the question of ventilation, but with no better result than in the case of the "Herbert Graham." Some evidence was given by the master of a vessel who had tried the mode of ventilating by air shafts, which had signally failed, and these, on subsequent voyages, were replaced by trunk boards placed on each side of the midship stanchions fore and aft in the hold, which seemed to be more effective. The separation of the cargo, as far as practicable, appears to be the most desirable mode of carrying a coal cargo liable to combustion, but even this cannot be relied on for long voyages unless the coals be shipped in a dry condition. With these remarks we beg to refer to the valuable evidence of Mr. Vassard, which, together with that of the former inquiry, appears to have exhausted the subject. Having regard to the position of the "Minnie Graham" in the South Pacific when the fire occurred, and the great distance from any port of refuge, the Court did not consider the abandonment of the ship premature, and returned Mr. Evans his certificate.

Given under our hands at the Town Hall in Newport, Monmouthshire, this 14th day of March 1874.

NELSON HEWERTSON,
THOMAS BEYNON,
Justices of the Peace.

We concur in this report.

HY. HARRIS,
FENTON WAKE,
Nautical Assessors.

CORRESPONDENCE, relating to SPONTANEOUS COMBUSTION, between the BOARD OF TRADE and the LOCAL MARINE BOARDS in the UNITED KINGDOM, arising out of the case of the "PERSIA."

The Board of Trade considered the subject referred to by the Court in their report of the loss of the "Persia" of so great importance, especially as it appeared therefrom that three vessels had been burnt in 1868, and their crews taken into Mauritius, that they forwarded an extract from the report to each of the Local Marine Boards in the United Kingdom and to Lloyd's, inclosed in a circular requesting their observations thereon. The following are copies of the circular and its inclosure:—

Board of Trade, Whitehall,
SIR, February 1869.

I AM directed by the Board of Trade to transmit to you for consideration the accompanying extract from the report of the Mauritius Marine Board on the loss of the 'Persia,' relating to the frequent cases of fire on board coal-laden ships.

The Board of Trade agree with the Marine Board in thinking the question one demanding serious consideration

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and would be glad to be favoured with any observations on the subject.

I am, &c.
T. GRAY.

The Secretary to the Local Marine Board.
At

EXTRACT from Report of Mauritius Marine Board.

"In reference to this loss the Board would remark, that in their opinion the burning of coal-laden vessels demands the serious investigation of scientific men. These fearful accidents are increasing in frequency, and spontaneous combustion is hardly a satisfactory conclusion to arrive at. Why is there spontaneous combustion? Why does one ship burn from that cause, and dozens of others laden from the same pit, at nearly the same time, arrive safely at their destination? Is ventilation of the coal advisable or dangerous? Ought hatches to be kept on or off? Could not inflammable gases be pumped out of a ship's hold? Is there not a method of creating gases in an inexpensive manner on board ship that would smother and extinguish any amount of fire in a vessel's hold? Such measures are spoken of commonly enough, but are apparently never carried into practice. Three large coal-laden vessels, the 'Pernix,' 'Volante,' and the 'Persia' have been burnt at sea, and their crews arrived in this colony during the last year. What destruction of property? What risk to life? What privation and suffering do these burnings entail? At this moment there is a valuable vessel in this port, coal laden which narrowly escaped the same fate as the 'Persia,' the coals having been smouldering many days before they could be extinguished."

To this circular the following replies were received by the Board of Trade from the Local Marine Boards:—

Mercantile Marine Office, 2, Dean Street, Cork,
SIR, March 12th, 1869.

AT a meeting of the Local Marine Board held to-day, Philip Scott, Esq., in the chair, my Lords' letter, M. 1658 of the 5th inst., was read, when I was directed to say that this Board fully recognise the necessity of some precaution or step being taken to prevent spontaneous ignition or combustion in coal-carrying ships, and would suggest that the opinion of scientific chemists should be taken at coal-loading ports. Mr. Scott directs me to say that he had ships for some years in the trade, and the precautions he used were as follows:—

The ship was platformed on a level with the kelson, and a wooden ventilator, 3 feet square, was placed in the centre of each hatchway; the top of the ventilator, 6 feet above the deck, and the bottom resting on the kelson in connexion with the platform. In stowing the coal care was taken to place good square blocks of coal at each side of the ventilator to prevent injury in loading up. He never had accident.

I have, &c.
JOHN H. HALL,
To the Assistant Secretary, Secretary.
Marine Department, Board of Trade.

Local Marine Board, 5, East India Avenue,
SIR, London, E.C., March 18th, 1869.

I AM directed to acknowledge the receipt of your letter of the 5th instant referring to the accompanying copy extract from the Report of the Mauritius Marine Board on the loss of the 'Persia,' relating to frequent cases of fire on board coal-laden ships.

I am to inform you that this Board have directed their attention to this most important question, and they are of opinion that the subject of spontaneous combustion in the coal of this kingdom when stowed in large quantities in ships and the consequent danger and destruction to life and property, should receive the most serious attention from the community at large, with the view of discovering, if possible, some simple and available preventive.

The Board are also of opinion that stowing coals in a ship's hold in a wet condition is the principal cause of spontaneous ignition. Coals are never transported either in barges or railway waggons under cover, so that whenever rain or snow is falling the coals absorb it all. In all, excepting the coal ports, coals are taken to ships in open barges which may have been exposed to two or three days' rain, they are frequently taken on board in rainy weather, and this, it is believed, causes them to become heated when stowed in large quantities, and in hot weather and under certain circumstances, ignition is the result.

This Board could instance cases where vessels ventilated in precisely the same manner, and when the coal has been shipped comparatively dry, have made their voyages successfully, while others which have taken in their coal during wet weather have had partial ignition.

The modes of preventing the shipment of wet coals are obvious; when in the coal ports and under the shoots it would be necessary to cease loading when rain or snow is falling, and when coals are taken alongside in barges, these barges should be furnished with tarpaulings, and coals when shipped for voyages which might extend to a month should be treated as dry cargo, those in charge of ships declining, of course, to load in wet weather.

The Board are also of opinion that the more ventilation resorted to the better; this should be done in the most simple and inexpensive manner, or it will be evaded as the freights for coals, notwithstanding the danger of ignition, are always low.

The Board in this communication will not attempt to suggest how such ventilation can be best managed as various modes may be adopted by different persons which might be equally efficacious.

The subject, however, is of such vital importance that the Board would suggest a prize being offered for the best paper on the most effectual and simple mode of preventing the ignition of coal on board ship.

I have, &c.
JOHN DOMETT.

The Secretary, Marine Department,
Board of Trade.

Local Marine Board, Sailors' Home,
SIR, Liverpool, March 19th, 1869.

I AM directed by the Local Marine Board of this port to acknowledge the receipt of your letter of the 5th instant, accompanied by an extract from the report of the Maritius Marine Board, and in reply to state that they can arrive at no other conclusion than that the destruction of ships referred to, was the result of spontaneous combustion of the coals.

Without entering into the investigation of the causes of spontaneous combustion, it is sufficient to know for all practical purposes, that all coals are more or less liable to spontaneous combustion; that the longer they remain undisturbed the greater is the danger, consequently vessels conveying coals to India, China, or other distant countries are more liable to be destroyed by the spontaneous combustion of their cargoes than those on shorter voyages; that some coals are more liable to this accident than others, especially those coated with iron-pyrites; some coals abound with this mineral, whilst others *from the same pit* are frequently *quite free from it*. This may in some cases account for coals in some ships undergoing spontaneous combustion, whilst 'dozens of others laden from the same pit at nearly 'the same time arrive safely at their destinations.'

A well-arranged system of ventilation will undoubtedly prevent the decomposition of coals that leads to spontaneous combustion; but ventilation, when applied after decomposition is carried to a certain extent, hastens the conflagration; thus, in the case of the 'Hesperus,' no indication of fire was observed until she had arrived at her destination in China, and her hatches had been opened for a few days.

Ventilation is, however, the best means of preventing the chemical action that leads to spontaneous combustion, but to be efficacious must be so conducted as not to expose the coals to moisture, since dampness is one of the conditions that leads to the spontaneous combustion of coals; for the same reason a cargo of coals should be always put on board as dry as is practicable, and every means adopted to protect them from moisture.

Dr. Inman, the brother of Mr. William Inman, of the Inman line of steam ships, has directed a considerable amount of attention to the subject of spontaneous combustion generally, and if consulted by the Board of Trade would probably afford valuable suggestions on this subject.

I am, &c.
The Assistant Secretary, JOHN T. TOWSON,
Marine Department, Secretary.
Board of Trade.

In accordance with this recommendation from the Local Marine Board at Liverpool, the Board of Trade forwarded an extract from the Report of the Mauritius Marine Board on the case of the "Persia," to Dr. Inman, stating that they would gladly receive and consider any communication relative to the matter which he might think fit to favour them with.

The following reply was sent to the Board of Trade by Dr. Inman:—

12, Rodney Street, Liverpool,
SIR, March 25th, 1869.

IN answer to your request for information respecting spontaneous combustion, let me, in the first place,

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express my gratification that the subject has been taken up by the Board of Trade. My investigations into it, some years ago, taught me that it was a fertile source of fire on shipboard, and in warehouses, yet that great ignorance prevailed respecting this form of catching fire amongst those whose business was to store various goods on land or water.

As it is necessary to touch lightly upon the whole question ere I answer specifically respecting the spontaneous heating of certain coals, allow me to state that there are many things which ignite without the intervention of extraneous fire. Amongst these the most prominent are freshly-burned charcoal in powder or in bulk, lamp-black, cotton-flax, or other fibrous materials saturated more or less with vegetable oils; the worst oils being such 'drying' oils as linseed, which are rendered much more liable to ignite spontaneously when they have been boiled. These fluids when in bulk have no such propensity, for an extensive surface exposed to the air is necessary for the chemical change to take place that produced the heat. Practically, all materials that are said to 'dry' by exposure are liable to heat, the dryness referred to being due to the absorption of oxygen from the air, and not to the evaporation of a volatile fluid. From the cause thus indicated engineers cotton waste, used for cleaning oily hands or oily machinery, recently made oil cloth or tarpaulins, bales of fibrous materials upon which oil has accidentally dropped, or in which it naturally exists, are very prone to ignite spontaneously. In Liverpool a large fire was attributed to the ignition of a heap of matting and other material permeated by castor oil.

Certain vegetable products, amongst which grass and hay stand foremost, are liable to self-combustion; and it is doubtful whether certain cotton is not somewhat dangerous from the same cause.

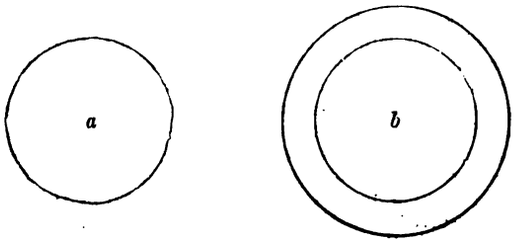
When spontaneous combustion arises it is brought about by chemical changes and the absorption of air.

As an illustration of the former, I may mention that very pure iron and lead, in a state of impalpable powder, will become incandescent in a few seconds after being exposed to the air. Potassium sodium will do the like. In these cases oxygen has been absorbed, and a new substance formed. Amongst the substances liable to heat spontaneously by chemical agency is sulphur. This phenomenon is seen on a large scale in volcanic districts, wherein vast tracts are heated to whiteness by combination of sulphur with other elements. It is important to notice that coals frequently contain a large portion of this material, generally in the form of "pyrites." The ignition of hay-stacks is also due to a chemical change in the juices of the grass.

As an example of ignition by rapid absorption of air, I may state that barrels of freshly-burned charcoal finely powdered have been found red hot at a foot from the surface.

I must next call attention to a very important fact which, though it seems to be a truism, has not yet been duly appreciated, viz., "the hotter a thing is the sooner it ignites, and the faster it burns." As an apt illustration, take a bottle of rum from a cold cellar, and plunge a candle or other light into it, you will find that the spirit will not ignite, and will extinguish the flame. Allow that same bottle to remain in a temperature of 80 degrees, and the spirit will then ignite on the approach of a lighted candle. Woodwork, persistently in contact with steam pipes, will ultimately ignite spontaneously; and hot or warm painters' oils and cotton wool together will begin to ignite almost instantaneously, although some minutes elapse ere the heat rises to redness. To this subject we must allude again when we speak of the ignition of coals.

There are many materials which ignite spontaneously under certain circumstances which do not necessarily under all, and although it seems paradoxical the very same agent which prevents combustion in one may encourage it in another case. That which promotes ignition is access of air, but if the dangerous body be small in bulk, this access of air will carry away the heat produced as fast as it is formed. A certain bulk in the mass liable to be heated is necessary for complete ignition. I may express what I mean by two diagrams, *a* and *b*, both representing spheres



of newly-burned charcoal, both equally absorb air and become heated, but the smaller sphere radiates away or otherwise loses its heat from the surface as fast as it is formed, but when the sphere is large the heat generated in the interior does not readily pass away, and it continues increasing, providing there is access of air, until a red heat is produced.

But if, knowing this, we should endeavour to cool the heated mass, or increase the current of air around it, with the same view we shall do no good, such a wind would operate as a blast upon a fire. If, however, the mass is cold to start with and of small bulk, good ventilation will prevent ignition. But in this case there is much danger, for a cask may be perfectly cold outside and incandescent in the middle, and in such a case ventilation would promote fire.

The fact that combustion may be proceeding in the centre of a mass whilst the outside is cold is readily recognised by the farmer who has to probe his hay-stack with a long iron rod before he can tell the extent of its heating, or if it is hot at all.

In one of my experiments I had a thermometer in the centre of a piece of cotton wool, on which I had sprinkled some painters' oil, yet these spots were so hot as to burn my finger, whilst the thermometer was unchanged. In a short time (half an hour) thereafter, half the mass was of a dull red heat, and on my simply touching it, the whole burst into a blaze. Whilst it was smouldering I could have saved half my cotton; after the flame arose this would have been impossible.

I must now call attention to the bearing of the law, "the hotter a thing is, the faster it burns;" thus, spontaneous combustion is a comparatively slow process; and requires a certain amount of bulk for its production; the heat in the mass steadily increases from without, inward ignition taking place at a distance from the surface; when, therefore, the inside is red hot, the outside is simply warm, but the whole mass heated by the chemical action becomes rapidly hotter as soon as it comes into contact with fire. Hence almost all fires arising spontaneously spread with amazing rapidity, for they take their origin from fuel peculiarly prone to ignite. Even the cook knows that hot wood will kindle the fire sooner and burn faster than cold wood, however dry.

When we consider that many of our ships travel for weeks together in a tropical climate, that their cargoes are kept perhaps at a temperature of 90° or more, the great importance of this law is at once recognised. All ships in hot climates are far more liable to ignition, and spontaneous combustion is more to be feared in them than in those trading in temperate zones. The more prolonged the heat the greater the danger.

Spontaneous combustion may be prevented or suspended by surrounding the material with any gas which does not support combustion, *e.g.*, nitrogen and carbonic acid. The first is innocuous to human life, the second is a deadly poison; a similar result may be obtained by preventing the access of air, as by surrounding the doubtful substances by tin or iron.

Having thus called attention to spontaneous combustion in general, I will address myself to the subject of coal. This material may be divided into two classes, the first of which is called anthracite, and appears to have undergone a sort of distillation by heat underground, and to be free from certain gases and sulphur; the second, or ordinary coal, contains a large quantity of gas in its interstices, and a notable amount of sulphur in the form of pyrites; the gas from it continues to escape from the time it leaves the mine until the whole is dissipated, hence old coals do not blaze, and coal in store always loses weight without there being peculation. In warm weather and when coal from fiery pits has been placed on board ship the gas extricated from the coal (carburetted hydrogen) mingles with the atmospheric air in the hold, and makes an explosive mixture that is liable to be fired by a sailor lighting his pipe, or by the galley fire. This danger continues for some time after the vessel has sailed, but may be obviated by careful ventilation.

The sulphur in the coals it is, however, which renders them most liable to spontaneous combustion, but there is some doubt as to the precise way in which it operates. In the absence of accurate chemical information the following broad facts may be stated:

1. A heap of slack in the centre of a coal yard will ignite spontaneously and in the central part first. This may be due to the same cause which operates in igniting freshly-burnt charcoal or lamp black, or it may be due to some chemical change with the sulphur. By some it is attributed to the decomposition of the pyrites by the influence of water or rain, or in the atmosphere. But none of these explanations can be regarded as otherwise than provisional.

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2. A heap of coals stacked up, under cover, against a warm wall, whose temperature does not exceed 100°, will ignite spontaneously, combustion beginning in contact with the wall.
3. A heap of coals in a steamer's bunker, and in contact with the steam pipes or the warm iron-work around the furnaces and engine will ignite spontaneously, the change occurring first in contact with the heated surfaces. Sulphur being liable to ignition at a low heat, it is probable that this substance has a great deal to do with the combustion. It is, I believe, certain that the ignition does not occur in non-sulphurous coals.
4. In every mine there are, I believe, varieties in the relative amount of sulphur present in the seams and the various workings, and hence I conclude that in vessels laden with coals from the same pit, there may be considerable variety in the quality of the material as regards sulphur.
5. I think that I may safely say a large block of coal has never been known to ignite spontaneously; even when burned on a fire it consumes itself slowly.

We are now in a position to draw the deductions:

1. That slack is more liable to ignite than lumps of coal.
2. That heat increases the propensity to spontaneous combustion.
3. That sulphurous coal is dangerous according to the amount of pyrites that it contains.

Hence follow the conclusions:

1. That coal ought not to be shipped in bulk when a large amount of slack must necessarily exist.
2. That shippers or merchants should be recommended to eschew sulphurous coal, which are readily recognised by their containing much shining whitish or yellowish material that almost looks like metal.

As the existence of heat as a source of danger, is constant in tropical regions, and as some coal-laden vessels, even under such circumstances, escape combustion, it is necessary to investigate the probable causes of exemption. These may be stated to be,—

1. The quality of the coal on board.
2. The method of packing.
3. The actual temperature met with during the voyage.

Of the first I need say no more.

Of the second I would tell an anecdote. Shortly after reading an essay upon the subject in hand, a gentleman, to me unknown, communicated to me a patent that he had taken out for ventilating a coal ship's hold, so as to prevent the accumulation of heat or dangerous gases. The plan was simple, and I sought for evidence of its utility. Within a twelvemonth, however, I read a description of the loss by fire of three coal-laden ships, all furnished with this man's patent. Consequently I could not regard ventilation of the coal, however efficient, as a preventive against spontaneous ignition.

In trying to pick up what information I could, along our quays, I found the opinion generally entertained, that it was safest to send coal to tropical countries, wherever the material was not anthracite, in barrels, large pieces without slack being selected. In any published or private reports that have come to my knowledge no mention has ever been made of coal thus packed igniting spontaneously.

It will be understood that the coal ignites not from the presence of inflammable gases, but from the chemical change taking place between the sulphur and carbon in the material itself, favoured by warmth, or by the absorption of air or both combined. But as to the exact nature of the chemical action there is doubt, and I am not now in a position to clear up the subject, not being a professional chemist.

I am now able to answer categorically the questions and remarks in the abstract referred to me.

1. 'Spontaneous combustion" is a very adequate cause for explaining the destruction by fire of coal-laden ships, indeed, without the existence of heated coals, it would take a long time to consume a cargo of coals in a vessel's hold.
2. There is spontaneous combustion, because of the presence, in bulk, of sulphur, carbon, or slack, with a tropical temperature.
3. The ships ignited by such a cargo may have taken in their coals wet, moisture in slack promoting its heating, or their coals may have been very dusty, close packed, and generally small; or they may have been unusually sulphurous, or the weather may have been unusually hot. I once read of five ships from one port, carrying coals from one pit, sailing to the same destination at the same time, all igniting.
4. Ventilation of the coal is not desirable, except to get rid of the danger of explosion. It increases the danger of spontaneous combustion.
5. The hatches ought to be opened from time to time to explore the coals, &c.
6. Inflammable gases can be pumped out of a ship's hold; but these do not influence the combustion of the mineral.
7. Inexpensive gases, which will not support combustion, could readily be made to deluge the hold. One form is that of Philips' fire annihilator, which consisted of nitrogen and steam, in which men could work for a short time. Another is carbonic acid, that may be generated in large quantities from common chalk, limestone chippings, with diluted acid of some kind. This gas would prevent seamen going down the hold to inspect the seat of fire.

Yet there is reason to doubt whether either of these would do good. Without absolute knowledge, I suspect that the fire always originates close to the vessel's side, which is heated by the sun. Every timber contains a large amount of air in the cells of the wood; the fire would be fed thereby, even if the hold was deluged by the irrespirable gas.

It must be noticed, too, that if the gas did put out the fire, unless the coal were cooled, the mass would soon ignite again. Even when a coal-pit on fire has been 'put out,' air is not permitted to enter until the ashes are cold. This cooling is effected by steam or water finely divided, as by syringes.

After giving the subject of the transport of coals to India, China, or generally hot countries, much consideration, the conclusions that I have come to are the following:—

1. Iron ships are superior to wood, for wood supplies air, and may ignite.
2. That each ship should have iron partitions, iron decks, and light iron covers to fit over the coals, so as to make, as cheaply as possible, so many iron chests, which would be available for any cargo, and would permit but little air to enter.
3. Each receptacle for coal should be probed every day with an iron rod in many places, so as to ascertain the existence of heating, and iron tubes should be at hand to pour water on the required spot.
4. In wooden ships coal ought to barrelled, having been previously "screened," or if coal is carried in bulk, there should be some empty space left, or other contrivance by which the mineral could be turned over, as is malt in a mill, or wheat in a warehouse.
5. In vessels not specially adapted for the trade, when the coals have ignited, air must of course be excluded; and carbonic acid or other gas forced into the hold, half a ton of limestone chippings, and a carboy of spirit of salt; (muriatic acid, which is, I think, cheaper, and certainly better than oil of vitriol or other acid,) that might be diluted with sea-water, would be ample supply for a voyage. To complete the apparatus, there should be a stoneware retort, or large kettle, into which the lime and acid might be placed, and a hose passing from the spout into any appropriate hole cut or left for the purpose.

I trust that I have explained sufficiently the subject of spontaneous combustion in coals. To illustrate my views still farther, I am taking the liberty of forwarding a copy of my essay that was written in 1855. To me the matter has long been one of philosophical interest, and I have regretted that it is so little known. Of the pamphlet, only about half a dozen copies remain, but if the Board of Trade consider the matter of sufficient importance to be more generally known, and should desire my services as editor of a new edition, I shall be glad to give my assistance.

I am, &c.

THOMAS INMAN, M.D.

To the Assistant Secretary,
Marine Department,
Board of Trade, Whitehall.

"Local Marine Board, Sunderland,

SIR, 31st March, 1869.

REFERRING to your letter of the 5th of March instant, M. 1658, forwarding copy extract from the Report of the Mauritius Marine Board on the loss of the 'Persia' relating to the frequent cases of fire on board coal-laden ships, I am directed to inform you that at the meeting of the Local Board held on the 17th instant, the communications were handed to a sub-committee to go into and report; and at a meeting of the Board held to-day, the sub-committee brought up a Report which was confirmed by this Board, who resolved that the same with the papers annexed be forwarded to the Board of Trade.

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I now therefore enclose the Report and papers herewith, setting out the views of this Board, and, I may add, that they consider the matter a very important one, and they have made a very full report on the subject.

I am, &c.

ROBERT BROWN,
pro Secretary.

The Secretary, Marine Department, Board of Trade.

Your sub-committee, having considered the questions submitted to this Board by the letter of the Board of Trade, dated March 5th, 1869, respecting the frequent cases of "fire on board coal-laden ships," have to report that they have not known any cases of spontaneous combustion on board ships load with north country steam coals. The cases which have come to their knowledge are mainly of ships laden with Welsh coals.

The cause of spontaneous combustion is in our opinion from the coals getting wet either before shipment or during the course of the voyage. We know that coals are frequently put on board in a wet state, as they are entirely exposed to the weather when they are conveyed from the pit to the ship. Cargoes shipped in this condition are very liable to spontaneous combustion.

The overloading of ships is a fruitful source of this evil, as it causes them to take much water on board at sea, a portion of which in all such cases makes its way among the coals, and, in many instances such overladen ships strain and leak, which increases the danger.

We consider that care should be taken that the water is not permitted to accumulate in the pump-well, so as to wet the coals in the bottom of the ships, particularly at the commencement of the voyage. Weight or pressure being one of the forces promotive of combustion the larger the ship, and the deeper the hold the greater will be the danger. But we think if coals are shipped dry and kept in that state with sufficient surface ventilation, fore and aft, at all times, it would effectuately prevent spontaneous combustion.

The reason why coals shipped from the same pit at nearly the same time, are conveyed safely to their destination by several ships, while one ship is burnt, is in our opinion to be accounted for by the cargo in the ship destroyed having become wet.

Respecting ventilation, we are satisfied that surface ventilation is right and good, and cannot be injurious unless combustion has taken place, but we think that shaft or funnel ventilation may be dangerous where the cargo has become wet.

We consider that hatchways should be kept uncovered in fine and dry weather, care being taken to prevent water going down upon the cargo.

Respecting the question of extinguishing and smothering fire in a vessel's hold by the application of gases, we are not prepared to offer any opinion on this scientific problem, our attention being particularly directed to the prevention of spontaneous combustion.

THOMAS ANDERSON,
Chairman, Sub-Committee.

The following paper was also inclosed in the letter from the Local Marine Board at Sunderland to the Board of Trade:—

The Board of Trade send a Report of the Mauritius Marine Board relative to the loss of the "Persia," and other two ships, yet they don't mention the description of coal, if North Country or Welsh.

The writer having been loser by two ships taking fire, has caused inquiries to be made as to the loss of property. The two ships will be described as No. 1 and 2.

No. 1 had a cargo of Welsh coals, 700 tons, on board, and was ventilated by three wood ventilators going down each hatch, yet after completing nearly half her voyage out, she took fire and was totally lost; crew saved.

No. 2 ship also took fire; and the captain ordered a hole to be bored in the bow to let five to six feet in the hold, and by perseverance the ship arrived at her port, the quality of the coals destroyed, in fact, a portion of them were cinders. Each of these ships had wood ventilators and from a report from this ship by the mate, he states the after ventilation was stopped up with coals, and yet most remarkable, the cargo in this part was quite cool.

It is remarkable that, few (if any) of North Country coals ignite, and yet one colliery near Sunderland, shipping about 2,000 tons daily, seldom have a case of firing. This is remarkable, for the coals are sent immediately to the ships, but every precaution is taken in keeping the hatches off whilst in harbour.

The cause of spontaneous combustion is difficult to discover, yet from experience it is found that large coals are not so liable, and several of the cargoes that have lately fired, had a large proportion of dead small in. This by lying so close, like the heaps at the pit mouth, is very liable to take fire.

It is evident there is something in Welsh coals which is not in North Country coal, and yet it cannot be gas, for explosions at sea are never heard of.

As to ventilating, it is the general practice in Wales to put wood square box ventilators in each hatchway with holes in the side; this is objectionable, and if the cargoes have to be ventilated, a division fore and aft the ship is preferable; the hatches kept off whenever the temperature is not too high.

There can be no doubt that salt water with some coals will cause fire, see extract from Captain Edwardes' letter herewith.

And a tin manufacturer states they have their charcoal heaps take fire, and they dare not put water on. It only helps to spread it. They carefully avoid water and simply rake it out.

The subject of spontaneous combustion is a very important one to coal owners, shipowners, underwriters, and the lives of the crew. If a scientific inquiry was made we have no doubt a saving of life and property would follow.

Extract from Letter from Capt. W. Edwards, of Barque "Mangosteen," dated December 18, 1868, Coquimbo, to Messrs. W. Nicholson & Sons.

"I write to inform you of my safe arrival, after a long passage of 93 days, all well. The "Patagonia" and us, we arrived both together last Saturday evening and moored on Sunday morning. The "Patagonia" has discharged 60 tons of coal overboard. He told me they were on fire, but there is no appearance of fire now. I always think it is the salt water getting in the coals that makes them take fire, which on my arrival, hearing of so many ships taking fire, I tried the experiment and wet the coals in the main hatch on Sunday evening, and commenced discharging on Wednesday morning; the coals were that hot where they were wet that it was almost impossible to stand in them to fill them. I am certain they would have taken fire in three or four days, but as soon as the wet coals were discharged the others were as cool as possible. I think if the hatches are taken off every opportunity, if only for an hour, and the salt water kept from them, I don't think there is any fear of them taking fire.

Local Marine Board, Leith,
3rd April 1869.

SIR,

I AM directed by the Leith Local Marine Board to acknowledge the receipt of your letter, M. 1658, of the 5th March 1869, transmitting for consideration copy extract from the Report of the Mauritius Board on the loss of the "Persia," relating to the frequent cases of fire on board coal-laden ships.

I am directed by the Board to report that they have been informed by Captain Thomas Lindsay, a member of the Local Marine Board, and also by several other captains of merchant ships who have had great experience in the command of coal-laden ships on long voyages. All these gentlemen give it as their opinion that *in all coal-laden vessels ventilators should be placed throughout the whole of the cargo up to the hatches, and that the hatches ought to be kept off as long as possible, when the state of the weather will admit of this being done*, a practice they state they have adopted for many years in carrying coals from various pits in the United Kingdom; by taking such precaution, they consider there is no danger of fire from spontaneous combustion on board coal-laden ships.

The Leith Local Marine Board, taking into consideration the opinion given by these very experienced ship-masters while in command of coal-laden vessels, beg to submit the same as worthy of the attention of the Board of Trade.

I am, &c.

THOMAS THOMPSON,
Secretary.

The Assistant Secretary, Marine Department, Board of Trade, London.

Local Marine Board, Dundee,
6th April 1869.

SIR,

I AM directed by this Local Marine Board to acknowledge the receipt of your letter of the 5th ultimo, transmitting an abstract from a report by the Mauritius Marine Board, relating to the frequent cases of fire on board coal-laden ships.

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The Local Board having had this subject under consideration, and being convinced of its very great importance, desire me to state in reply, that the branch of the subject relating to means that might be employed for extinguishing fires in such cases is so much a question of science that they decline to offer any opinion on it.

At the same time the Local Board is convinced that much might be done in the way of prevention by proper ventilation, and the Local Board would feel obliged by being furnished with the reports (for perusal) the Board of Trade has received following investigations in cases of the kind referred to, if any such investigations have been made.

I have, &c.
THE SECRETARY.

The Assistant Secretary,
Marine Department, &c.

Local Marine Board, Newcastle,
14th April 1869.

SIR,

I AM directed by the Local Marine Board to acknowledge the receipt of your letter of the 5th ultimo, together with a copy extract from the Report of the Mauritius Marine Board on the loss of the "Persia," relating to the frequent cases of fire on board coal-laden ships, and stating that the Board of Trade would be glad to be favoured with any observations on the subject.

In reply, I am to state that the Local Marine Board are of opinion that the subject in question is one that demands the serious attention of merchants, shipowners, underwriters, and all parties interested in the commerce of the country.

The Local Marine Board have felt it to be their duty to obtain the opinion of some of the most eminent colliery engineers in this neighbourhood, acquainted with the nature of the substance of coal, on the important subject in question. Gentlemen believed to be the best able to form a correct judgment on the points raised in the correspondence referred to, and in whose opinion the Local Marine Board have great confidence.

The following is the opinion of each of the gentlemen referred on each of the questions raised :—

1st Question.—*Why is there spontaneous combustion on board ship?*

Answers.

(*a.*) From the heat produced by the decomposition of the pyrites existing in the coal.

THOS. E. FORSTER.

(*b.*) Coal is a substance composed of many ingredients, all of which are, under certain circumstances, liable to the action called fermentation; but the most active agent is the presence of moisture in contact with iron pyrites, commonly called coal brass. It has been found in colliery practice that large heaps of coal placed on the ground in the unscreened condition are much more liable to take fire from this cause than similar heaps of the same coal put down in the screened condition. This difference is obviously due to the smaller amount of moisture held by the coal in the latter. There is no reason to suppose that this cause will be in any degree less active in ships laden with coal than in heaps of that mineral placed upon the gronnd of the same cubical measure.

JAMES EASTON.

(*c.*) It is caused by the decomposition of iron pyrites which ought to be separated and taken out before the coals are shipped.

JOHN R. LIDDELL.

2nd Question.—*Why does one ship burn from that cause and dozens of others laden from the same pit at nearly the same time arrive safely at their destination?*

Answers.

(*a.*) Some cargoes may contain more sulphur than others and salt water may get amongst the coals during the voyage.

THOS. E. FORSTER.

(*b.*) So far as the coal itself is concerned, there cannot be any great difference in the quality of that raised from any one pit or coal seam from day to day, except in the care taken to pick out all the pyrites, or other foreign matter, which also has a tendency to produce spontaneous combustion. The greatest difference will be found in the relative condition of the ships themselves, in regard to their water-tight conditions, especially in their decks and topsides, which in heavy weather may admit more or less water upon the surface of the cargo, as well as the care with which the bilge water is pumped out.

JAMES EASTON.

(*c.*) One cargo may contain the pyrites and others not, all depends on the cleaning of the coals.

JOHN R. LIDDELL.

3rd Question.—*Is ventilation of the coal advisable or dangerous?*

Answers.

(*a.*) I consider that ventilation is of little consequence.

THOS. E. FORSTER.

(*b.*) Ventilation of the cargo of coal can only be dangerous when the process of fermentation has passed through the incipient into that of active combustion, the former known by the smell of carbolic acid which accompanies it, the latter by an evolution of visible vapour, which is often inflammable. It is advisable in all cases to ventilate the coal placed on board a ship bound to a distant port, and more especially so when that coal is shipped in the unscreened condition, as it usually is when exported for gas making, or manufacturing purposes. The mode of ventilating a cargo of coal of the kind above alluded to in the most efficient and least expensive manner, is to use a considerable extent of wooden trunks or boxes of variable area to suit the size of the ship, say from 8 to 12 inches square inside. These should be placed horizontally, fore and aft of the ship, in one or more lines, and a few feet above the ceiling of the ship's hold, each line connected with the different hatchways of the ship by vertical trunks or boxes of the same dimensions, and reaching up to the under side of the hatches themselves. These air trunks, both horizontal and vertical, should be perforated with small holes wherever they are placed below the surface of the coal. These air trunks must of course be put into their places while the ship is being loaded, and should in no case be allowed to become filled with coal. It is also of very great importance that in all cases of wind and weather permitting the commanders of ships and their officers when carrying coal should be required to remove one or more hatches from every hatchway each day during daylight.

JAMES EASTON.

(*c.*) Desirable to be done with gas coals, not necessary with others.

JOHN R. LIDDELL.

4th Question.—*Ought hatches to be kept on or off?*

Answers.

(*a.*) Not of much consequence.

THOMAS E. FORSTER.

(*b.*) Answered in No. 3.

JAMES EASTON.

(*c.*) Hatches to be kept on.

JOHN R. LIDDELL.

5th Question.—*Could not inflammable gases be pumped out of a ship's hold?*

Answers.

(*a.*) Spontaneous combustion does not arise from the gases.

THOMAS E. FORSTER.

(*b.*) Inflammable gas can only arise in a ship's hold from two causes; the first is from the gas contained in the pores of the coal on its severance from the coal seam, and is not dissipated in the course of its transit and shipment, and many explosions have arisen from this cause by reason of the hatches having been placed on the hatchways immediately on the vessel having been loaded. The other cause is derived from the coal when the incipient combustion is about to burst into the active condition.

JAMES EASTON.

(*c.*) Don't think pumping practicable.

JOHN R. LIDDELL.

6th Question.—*Is there not a method of creating gases in an inexpensive manner on board ship that would smother and extinguish any amount of fire in a ship's hold?*

Answers.

(*a.*) I do not consider this practicable.

THOMAS E. FORSTER.

(*b.*) There is a method of making a gas that would be inexpensive on board ship or elsewhere, and if it could be

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applied direct to a fire would certainly assist very materially in extinguishing it. The difficulty of its application to a fire, and that attending the exclusion of atmospheric air at the same time, would render its effect extremely uncertain.

This gas produced by the application of *dilute* muriatic acid to dry chalk or marble, and called carbonic acid gas, would be readily made on board ship by the use of a few old tubs or casks, but considerable risk would attend going below for some time after its application.

JAMES EASTON.

(*c.*) I believe not.

JOHN R. LIDDELL.

The Local Marine Board from their own experience can say that in all well-managed ships loading from this district for foreign ports and distant voyages, the practice observed is to give as full and as free ventilation as possible during the loading, and whilst in harbour prior to sailing; and when the weather permits at sea to open all hatches, using wind sails, &c., care being taken to keep the coal free from moisture.

I have, &c.

WM. STOREY WHITFIELD,
Secretary.

The Assistant Secretary,
Marine Department,
Board of Trade, London.

Local Marine Board,
Belfast, 14th April 1869.

SIR,

WITH reference to your circular of the 5th March last, M. 1658, I am directed to state that this Board considers that iron lower masts, perforated below and above, by acting as funnels to carry off inflammable gases, would greatly tend to the safety of coal-laden vessels on long voyages.

I have, &c.

A. ATKINSON,
Secretary.

To the Assistant Secretary,
Marine Department,
Board of Trade.

Local Marine Board, South Shields,
16th April 1869.

SIR,

I AM directed by the Local Marine Board to acknowledge the receipt of your letter of the 5th March last, accompanying copy extract from the report of the Mauritius Marine Board on the loss of the 'Persia,' relating to the frequent cases of fire on board coal-laden ships, and requesting to be favoured with any observations on the subject.

And I am to state that, in the opinion of this Board, danger of fire on board coal-laden ships appears to arise from two causes:—(1) from the coals being laden in a damp state, or from their becoming wet afterwards from the casualties of the voyage; and (2) from the cargo containing in some cases a considerable quantity of carburetted hydrogen gas.

When coals are to be shipped for a long voyage they should not be allowed to be taken in after any considerable exposure to wet; and whether for a short or long voyage, coals from workings known to contain explosive gas should not be shipped without having stood some days (protected from wet) to allow the escape of gas as much as possible.

From the experience of several members of the Local Marine Board, they are convinced that proper ventilation is advantageous, and ought in all cases to be provided for. This can be cheaply and efficiently done by wooden vertical ventilators properly perforated, their number and position being regulated by the size of the vessel. If they are connected by horizontal tubes the ventilation will be more perfect. They need not be brought above the hatches, which, moreover, should be opened from time to time, whenever the state of the weather will allow without exposing the cargo to wet.

The plan recommended in the Shipping Gazette (19th February 1869) appears likely to abate materially if not entirely to remove danger from fire, but the Local Marine Board are of opinion that the object can be obtained by less expensive means.

But by whatever means it is to be accomplished, the Local Marine Board would urge the absolute necessity of providing sufficient ventilation.

I am also directed to send for the consideration of the Board of Trade the annexed remarks on the subject by James Mather, Esq., a member of the Board, whose knowledge of the chemistry of gases, and whose experience in relation to pit accidents and explosions, render these remarks worthy of attention.

I am, &c.

Your obedient servant,

J. W. LAMB.

The Assistant Secretary,
Marine Department,
Board of Trade.

MR. J. MATHER'S PAPER.

Oxygen 1·000	Carburetted Hydrogen. 0·555	Nitrogen 0·9722
Life and Flame giving.	Explosive Gas. Mines.	Destructive gas.

To clear ships from the effects of cargoes of coals, the light carburetted hydrogen gas, the inflammable gas of mines, which becomes hot, and then bursts into flame by spontaneous combustion, and renders it dangerous for the ship to be exposed to it. This gas is about half the weight of common air, 0.555. It is found sleeping in the upper part of mines, or seeking to free itself from deposited or broken coal, or detaches itself from amongst water, and comes to the surface, and rises to the atmosphere where it is received.

Nitrogen is absorbable by about 100 volumes of water, and extinguishes flame. Its specific gravity is about 0·9722. The nitrogen forms about four fifths of the atmosphere, is unlike its oxygen, does not add light to combustibles, but on the contrary extinguishes it; the carburetted hydrogen dies in it. It being pumped through wooden or metal pumps perforated with holes from 1-inch or to 2-inch holes, the latter, if thought proper, to be covered with wire gauze or with perforated zinc, where it will be diffused when carried to the atmosphere, the breeze absorbing it; and thus will the threatened catastrophe of this great maritime calamity be mastered and dispersed.

JAMES MATHER,
Member of the Local Marine Board, South Shields.

April 14th, 1869.

THE GASES PRODUCED IN COAL CARGOES.

To clear ships from the dangerous concomitants of coal cargoes, it is simply necessary to pump out the light carburetted hydrogen from the hold, and thus free them from this gas, which becomes heated and spontaneously bursts into flame. This gas is about one half the weight of common air (0·555). It is always found floating about the upper part of mines, or seeking to creep away from deposited or broken coal, or detaches itself from amongst water and rises to the surface, thence passing away into the atmosphere.

Nitrogen also found amongst coal is absorbable by about 100 volumes of water. Its specific gravity is about 0·9722. It extinguishes the flame of the light carburetted hydrogen.

Wooden pumps perforated with holes, reaching to the decks from a platform laid upon the keelson, would certainly cause the carburetted hydrogen to find its way to the decks, whence it would be harmlessly diffused in the atmosphere.

The usual and safe way is to fill in the coals around the perforated tubes. These perforations should be one inch, or even two or three inches in diameter. In the latter case the holes might be covered with strong gauze or perforated zinc, whereby the inflammability of the carburetted hydrogen would be materially abated, if not entirely destroyed, whilst the pumping would discharge this gas freely upon deck, whence it would be swept away by the breeze.

By this simple process I think all danger of such fearful catastrophes as have occurred will be obviated.

JAMES MATHER,
Member of the Local Marine Board, South Shields.

Local Marine Board, Greenock,
7th May 1869.

SIR,

REFERRING to your letters of the 2nd and 5th March, I now enclose a report by a committee of this Board adopted at a meeting of the Board, held on the 27th ult., on the subject of spontaneous combustion in coal-laden vessels.

I am, &c.

THOMAS KING, Secretary.

The Assistant Secretary,
Marine Department, Board of Trade,
Whitehall, London.

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The Committee of Marine Board on spontaneous combustion in coal-laden ships, after considering information obtained from various parties likely to be well informed on the subject, report as follows, but with reference solely to the Clyde district.

Conflicting opinions are entertained as to the cause of recent casualties to coal ships loaded in the Clyde, (vessels loaded there having for many years, till within about a year ago, enjoyed an immunity from such casualties,) but there seems to be a general agreement of opinion that spontaneous combustion at sea arises more frequently from loading what is locally named main seam coal, which contains much sulphurous matter, than from the other principal seams in this neighbourhood called ell and splint, also that mixed coal, viz., cargoes loaded from different pits, are from whatever cause more likely to ignite, than those loaded altogether from one pit, and that especial danger arises from coal being loaded in a wet state.

Suggestions in the way of remedy which the committee venture to make are,—

1st. That it is safest to ship only splint coal for long voyages.

2nd. That cargo should be as far as practicable loaded from one pit.

3rd. That the greatest care should be taken to secure the shipment of coal in as dry a state as possible.

4th. That ships' holds should be efficiently ventilated, and to aid ventilation that the hatches should be taken off at sea as frequently as possible.

5th. That some simple plan should be adopted for ascertaining and recording the temperature of the hold daily or oftener, so that the earliest possible notice may be given of danger.

The whole subject is surrounded with difficulties, and perhaps ought on account of the conflict of opinion to be reported on by eminent chemists. The Committee therefore hesitate to give any very decided opinions on the question.

JOHN H. CARMICHAEL, Convener.

Greenock, 23rd April 1869.

Local Marine Board, Glasgow,

SIR, 2nd June 1869.

AT a meeting of this Board on the 31st ultimo, I was directed to acknowledge receipt of your communication of 5th March last transmitting for the consideration of this Board a copy of an extract from the report of the Mauritius Marine Board on the loss of the 'Persia,' relating to the frequent cases of fire on board coal-laden ships, and requesting the observations of this Board on the subject, and I am to state that the experience of the members of this Board was against spontaneous combustion, that in their opinion ignition was usually caused, either by leakage, or by the coals having been shipped in a wet state, and that they would recommend that care should be taken that coals are shipped dry, kept so during the voyage, and thoroughly ventilated.

I am further to state that the members resolved, if possible, to obtain the opinion of practical men on the subject, and that any information so obtained will be duly reported to the Board of Trade.

I have, &c.

J. MUIRHEAD,

The Assistant Secretary, Secretary.

Marine Department, Board of Trade,

Whitehall, London.

The following letters were also received at this time by the Board of Trade on the subject of spontaneous combustion in coal ships:—

1st. On 24th March 1869 Mr. Towson of Liverpool forwarded a copy of the printed slips issued since Dec. 1867 by the Liverpool Salvage Association, containing the following report on the system of ventilation in coal ships, with suggestions for its improvement:—

FIRES IN COAL SHIPS.

REPORT ON THE PRESENT SYSTEM OF VENTILATION, AND SUGGESTED IMPROVEMENTS.

Salvage Association: Underwriters' Rooms, Liverpool, Monday, December 16, 1867.

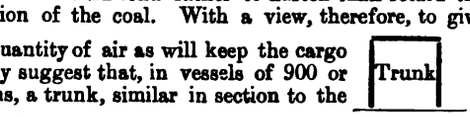
The mode of ventilation at present adopted here on board of vessels taking coal cargoes for long voyages is to place a vertical shaft down each hatchway, composed of two strong boards about 24 inches apart, connected by short pieces of wood, which overlap each other like a Venetian blind; these shafts rest on the keelson, and are usually connected together by horizontal trunks which run fore and aft on each side of the keelson, and are formed by boards which rest on the ceiling and lie obliquely against the keelson.

These shafts and trunk have hitherto been considered sufficient to allow the escape of any gas which may emanate from the coal, and to allow the circulation of sufficient air to carry away any heat which may be generated in the hold of the ship.

The burning of three or four coal-laden ships from this port, and the reports from other vessels which sailed hence and which have arrived at their destination with their cargoes in a very heated state, indicate that this method of ventilation is not sufficient, or that it is not adequate to the ventilation of large ships.

It has been supposed that in ships which are laden at the coal tips the great weight of the coal thrown in at once may break the trunk or shafts, and allow small coal to fill them in places, and that occasionally the coal may even be projected into the top of the shaft, and that thus the proper circulation of air through the shafts is prevented.

After duly considering the subject, and without denying that accidents to the shafts and trunk may sometimes occur while the vessel is loading, the surveyors of this Association have come to the conclusion that in large ships a much more extended system of ventilation should b adopted. *They attribute the heat to the spontaneous and slow combustion of the small and dust coal in the bilges, and think it can be traced to this small coal becoming wet during the voyage, or to its being shipped in a more or less damp state.* On the supposition that the fires reported are due to this cause, it seems not unlikely that a limited supply of air would tend rather to hasten than retard the combustion of the coal. With a view, therefore, to give such a quantity of air as will keep the cargo cool, they suggest that, in vessels of 900 or more tons, a trunk, similar in section to the



annexed figure, and formed of stout planks, shall be carried fore and aft, about 3 feet above each bilge, and that these shall be connected by transverse trunks to the vertical shafts which lead up to the hatchways. These are in addition to the usual trunks alongside the keelson.

In ships of large burthen which have no 'tween decks laid, two additional trunkways should be placed fore and aft on the top of the 'tween deck beams, and these should also be connected by transverse trunks with the vertical air shafts.

There is another system of ventilation of coal cargoes which the surveyors to this Association consider may advantageously be adapted in those ships which are permanently fitted with the large flange ventilators which run down to the lower deck at their fore and after ends, as in the Australian or American packet-ships, viz., that of trunks running horizontally through the whole body of coals to the fore and after ends of the vessel beyond the cargo, and connected with the flange ventilators, by means of which currents of air could be made to pass through them from aft to forward, or forward to aft, according to the direction of the wind at the time.

Either of these plans, it is thought, would tend to reduce the risk of fire to which coal-laden vessels are now exposed.

It is also suggested that the temperature of the air in the shafts or trunkways should be taken every night and morning and recorded in the ship's log-book, as such observations would indicate the presence of heat in the hold long before it could reach any dangerous degree.

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2. The following letter from Mr. George Fawcus, of North Shields.

North Shields,

DEAR SIR, April 27th, 1869.

I BEG leave respectfully to submit for your consideration the following suggestions to prevent the so frequently recurring explosions on board of gas coal laden vessels.

Many plans have been tried to ventilate *the hold up to the deck*, by means of perforated boxes alongside of the keelsons, boarding alongside of the hold beam stanchions, or shafts up to the hatchways, &c.

A simple plan now seems wanted to allow the gas to escape *from underneath the deck without allowing water to fill the hold.*

There are two ways of doing this, either by ventilating tubes in the way of the masts amidships, or in the way of the rigging at the sides.

A metal tube closed up to the hold beams and perforated between the hold beams and the deck, and carried up, say, four feet above the deck, would serve as a ventilator

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to the hold, and also as a well for sounding the pump well without drawing the pump boxes. The end of this tube could be left open always, with safety, in a coal-laden vessel, and in vessels with damageable cargoes could be closed with a plug during bad weather.

A tube could be placed on the rails (protected by the rigging), communicating with ventilators or air ports in the between-deck ceiling, the covering boards, and a water-tight space between two stanchions under the rail.

I am, &c.

The Assistant Secretary, GEORGE FAWCUS.
Marine Department,
Board of Trade,
Whitehall, S.W.

P.S.—Grain cargoes also require ventilating.

And 3rdly, two letters from Mr. W. C. Perry, of which the following are copies:

West Hartlepool,
20 Scarboro' Street,
May 25th, 1869.

SIR,

I BEG to acknowledge the receipt of your letter of the 19th instant, stating that the Board of Trade is prepared to receive any observations upon the causes of spontaneous combustion in coal-laden vessels.

The remarks I have to submit are few and simple, and apply only to vessels making sea voyages, and I will ask permission to repeat a former question, whether the risk of these disasters would not be greatly lessened if this kind of freight were confined to iron ships having nothing of wood below the upper deck.

1. An admitted cause of spontaneous combustion of coal is that of its being shipped wet, and when the form of the trucks used for conveying coals to ships is considered it will appear how it happens at times that it is shipped very wet.
2. The form of these trucks is that of an inverted cone, and in consequence there is a very large exposed surface, sufficient in a single day's rain to allow the whole mass to be penetrated with this wet.
3. From want of skill in working, or from the nature of the material, there is a large proportion of small coal shipped in these parts, and this greatly increases the danger in wet weather, and from some experiments I have made since the receipt of your letter it is apparent that small coal has a capacity for retaining moisture, beyond what is likely to be considered. In this particular, as well as in mineral difference, the Welsh steam coal appears better and safer for long transport.
4. The remedy suggested is that all sea-going ships be loaded from covered trucks (or "waggons"). A light inexpensive cover open at both ends and removable when not required could be fitted in a way not to interfere at all with loading and discharging.
5. Another known cause of spontaneous combustion is that of the gases in some kinds of coal. In a deep mine in the north I was led to notice the incessant sound of gas escaping from a "new working" and it is not easy to doubt that if coal in this state were at once to be shot down a ship's hold it would be unsafe. The remedy appears to be exposure to the action of the air for a sufficient time before being put on board.
6. Passing to the possible causes of spontaneous combustion, may there not be cases where the condition of the hold from a previous cargo has operated in this way? As an instance, may not coal after guano (especially in wooden vessels) be an originating or at least an accelerating cause of generating inflammable gases.
7. Whether in some instances of apparent spontaneous combustion in cotton and in wool-laden ships the cause may not be due to excessive friction of the cargo at certain points in the hold when the ship is labouring heavily in a high sea?
8. Concerning the question as to whether ventilation is advisable in coal-laden vessels, I would submit whether partial ventilation is not more calculated to aid combustion than to check it, and that unless ventilation can be carried out more effectually than by any means yet discovered, it would not be safer to keep the hold shut up, and in an emergency to resort to flooding rather than to any other means.

I am, &c.

Assistant Secretary, W. C. PERRY.
Marine Department,
Board of Trade.

Cantreff House, Abergavenny,
July 8th, 1869.

SIR,

SUPPLEMENTARY to my letter of 25th May I beg to offer one or two other observations upon the subject of spontaneous combustion in coal-laden vessels.

Disregarding doubtful causes of these disasters, there are two held certain: first, moisture either at the time of loading or afterwards; second, the gas contained in the coal.

MOISTURE.

From experiments I made in the north, I found that the amount of moisture coal will retain varies not only with the size of it, as was to be expected, but with the quality; so that hardly any two samples from different mines in the same district appeared alike in this particular. The small stuff called 'duff' retained 6 per cent. of moisture, which in a cargo of 1,000 tons would give 60 tons of water, and although this is an exceptional case, it is to be noted that general moisture or dampness in a coal cargo is not at all required for combustion. In local and probably very limited centres of moisture may be found the germs of danger, and to a single waggon of wet coal at loading might be traced the destruction of a ship at sea.

Hence, as I before submitted, the importance of not allowing sea-going ships to be loaded from open waggons in all weathers.

GAS.

To illustrate the necessity of exposing some kinds of coa to the action of the atmosphere before loading, it is only necessary to mention that I have notes of nine cases of explosions which occurred shortly after the loading had been completed.

VENTILATION.

It does not seem as if the question of ventilation can be met by fixed rules, as on account of variety of circumstances cases require to be dealt with differently, and I would submit to your department as a subject for inquiry, the difference between the gas or gases native to the coal, and which occasioned the explosions alluded to above, and the gas or gases generated from wet coal.

The former requiring the contact of sparks or flames before explosion, the latter resulting in spontaneous combustion.

I am, &c.

Assistant Secretary, W. C. PERRY.
Marine Department,
Board of Trade.

The following CASES of SPONTANEOUS COMBUSTION in COAL-LADEN SHIPS, which have occurred since the appointment of the Royal Commission for inquiring into the Cause of the Spontaneous Combustion of Coal in Ships, have been reported to the Royal Commission by the Board of Trade.

"AURELIE" barque of Quebec, 548 tons register, six years old, and classed L. 11 Veritas, for nine years.

REPORT of a NAVAL COURT held at HER BRITANNIC MAJESTY'S CONSULATE GENERAL, NEW YORK, on Friday the 3rd day of September 1875.

PRESENT:

E. M. ARCHIBALD, Esq., C.B., Her Britannic Majesty's Consul General, New York, President.
THEODORE COOK, master of the steamship "Russia," of Glasgow, O.N. 58312.
WILLIAM WALKER, master of the ship "Greenock," of Greenock, O.N. 66083.

The court was assembled for the purpose of inquiring into the circumstances connected with the loss of the barque "Aurelie," of Quebec, official number 59894, which vessel foundered and was lost at sea on the 7th August last.

The late master of the "Aurelie," Octave Côté, the chief mate, James Bailey, and the scond mate, Alphonse Côté, were in attendance, and, being respectively examined, stated as follows:—

OCTAVE CÔTÉ sworn:—I was master of the barque "Aurelie," of Quebec. I took command of her on the 17th of October 1873. I hold a certificate of competency as master of the "Dominion of Canada," No. 621.

The "Aurelie" was a wooden ship of 548 tons burthen,

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built at Quebec in 1869. She was coppered. We took in a cargo of coal at Liverpool in April last in the Bramley Moore dock. We were occupied two days in shipping it. It was English steam coal, brought from some place near Liverpool. I cannot say from what place it came. It was bituminous coal. I cannot say whether it was Welsh coal or not. We took in 701 tons. My opinion is that it was English, and not Welsh. As far as I can recollect, the weather was fine and dry. I know that the second day that the coals were shipped was a very fine day. I do not recollect that it rained on either of those days. The coals were apparently of good quality and good order. The vessel was not completely loaded; she could have carried 150 tons more. I have never carried a cargo of coals in this vessel before. She had a freeboard of fully six feet. She was in good order and well found in every way. She had just been newly coppered in April. Her class was L 11 Veritas. She had been classed for nine years, and there were three years then to run. Our crew and myself were 14, all told. We sailed from Liverpool on the 16th of April for Barbadoes and a market. We arrived at Barbadoes on the 31st of May without any occurrence worth mentioning.

We remained at anchor in Carlisle Bay for 20 days. There was no sale for the coal there, nor in the neighbouring islands to which I telegraphed; and having received orders from my owners to proceed to Montevideo, we sailed from Barbadoes for Montevideo on the 20th June. We had very fine weather during the time we lay at Barbadoes, not very hot. We had the fore hatch, or rather one half of it off, during the time we lay there, in order to ventilate the ship. There were two or three showers during the time, but when it rained the hatch was put on, and the cargo covered. We left Barbadoes with strong trade winds and ran to the eastward until we were in about 32° north latitude. After that we had light and variable winds, but beautiful weather, until the 1st of August, when we were in 16° 39 north latitude, and 30° 16′ west longitude. Between 6 and 8 o'clock on the evening of that day the second mate reported to me that there was fire in the hold. He said he judged so because there was unusual heat and gas. I went at once into the hold and digged down into the coals about a foot, near the quarter hatch; I put my hand on the coal where I had digged and found the coal so hot that I could not bear my hand on it for a minute. We were then on the port tack stretching to the southward. The crew wished me to turn back to Barbadoes. I said I would not, as Pernambuco was quite as near, and that when it would be daylight on the morrow we could see better what was best to be done. Next morning I took a jack stay, an iron rod about 15 feet long, which I shoved down through the coal at the quarter hatch to a depth of about 12 feet, This was at 5 a.m. on the 2nd of August, I left the rod in the coal for two hours, and then drew it up. The middle part of it was red hot, the bottom part cool, and the upper part so hot we could not handle it, but had to put straps round it. At 7 o'clock I decided to bear up for Barbadoes, in order, if possible, to save the ship. As soon as we drew up the rod the smoke followed and burst up. Some of the crew also digged down with shovels some 3 feet, and about 5 or 6 feet from the ship's side, and the smoke came up so strong that the crew could not stand it. I ordered them to fill up the hole again and come on deck, and then I had the hatches closed down tight, and we abstained from pumping, so that the water might rise in the ship, and if possible extinguish the fire. We made all the sail we could for Barbadoes. We perceived the smell of wood smoke, and knew that some of the beams must be burning. On the 3rd of August the fire increased, and the deck became hot. I left part of the forehatch open, to permit the smoke to escape, and also least the gas might blow up the ship. We got the long-boat over the side and fitted her, in case we might have to leave the ship. On the 4th the heat and smoke still increased, and we got the chains on deck lest the heat should prevent us. On the 5th August smoke and heat still increased greatly. The pitch was boiling in the deck seams, and we could no longer live in the cabin on account of the dense smoke and gas. All the ropes and gear from below were got on deck.

On the morning of the 6th of August, it became evident that the ship must be abandoned, as she was then burning. We got out the second boat and provisioned it, taking as few clothes and effects and as much food as possible, as we we were then 1,500 miles from land. At noon on the following day, the 7th of August, we pumped the vessel dry. This was the ffrst time we pumped her after the discovery of the fire. At 4 p.m., on sounding again, we found 3½ feet of water, showing that her side must have been burnt through. At 5 p.m. she had about 6 feet of water in her; at all events she was settling fast. We then all took to the boats and lay by the ship until 9 p.m., when she sunk. Besides our crew, there was my wife and an infant child of about two years. We steered for Barbadoes, the two boats keeping together from the 7th of August until the 10th of August, on which day, at about 7 a.m., we were picked up by the American ship "Moonlight" from Batavia bound to New York, and were brought in that ship to this port, and landed on the 31st ultimo. My wife was confined on board the "Moonlight," and gave birth to a male child on the 28th ultimo.

I suppose the cause of the fire was spontaneous combustion. The ship made regularly nearly one inch an hour of water on the voyage out to Barbadoes. After leaving Barbadoes she did not make more than three-quarters-of an-inch per hour. She was regularly pumped dry twice a day. I suppose that the damp or water rising up through the coal, in connexion with the sulphur in the coal, generated combustion. The coal was loaded on the skin of the ship, that is the usual mode. The bilge-water never could have risen to the skin, except when we left it after the discovery of the fire. I do not know whether the ship or cargo were insured.

(Signed) OCTAVE CÔTÉ.

(Signed) E. M. ARCHIBALD,
H.B.M. Consul General,
President.

JAMES BAILEY, examined: I was chief officer of the late barque "Aurelie" of Quebec. I joined her at Liverpool on the 16th of April last. I hold a mate's certificate of servitude, No. 79,049. I superintended the loading of the ship at Liverpool. We were two days taking in the cargo of coals. They were common house coals. I do not know where they came from. The hold was dry when we took them in. The weather was dry while we loaded. No rain or wet got on them at that time. I remember the discovery of fire in the coals on the 1st of August. It was my watch on deck. The second mate first reported it. On the following morning we pierced the coals with an iron rod, and left it for two hours, and when it was drawn up the rod was red hot. The smoke and heat increased from day to day until the 7th of August, when we were compelled for the safety of our lives to leave the ship. There was nothing in our power which we could have done which would have saved the ship. The cause of the fire must have been damp among the coals, and they had been nearly four months in the ship. I have been two voyages to Bombay in ships with coals from England, we had no fire on either occasion.

The length of each voyage was about three-and-a-half months. We were perhaps about a month in passing through the tropics.

I think that being detained for a long continuous period in the tropics would increase the hazard of fire in a coal cargo. (The master's statement was here read to this witness.) The statement of the master is quite correct so far as I recollect. We had very moderate weather the whole voyage from Liverpool, and did not lose even a ratline.

(Signed) JAMES BAILEY.

(Signed) E. M. ARCHIBALD,
H.B.M. Consul General,
President.

ALPHONSE CÔTÉ.—I was second mate of the late barque "Aurelie." I am brother of the master. I remember the occurrence of the fire on the 1st of August last. One of the sailors and cabin boy said to me they smelt fire below. I then went into the hold; this was about half-past 6 in the evening. I did not see anything, but I smelt the gas very strong. I then went and reported it to the master. He came immediately and went below, and made an examination, and we all smelt the smoke.

The same night I digged a hole about two feet and a half deep in the coal, and I could not bear my hand on the coals they were so hot. Next morning we pierced the coals with an iron rod, which when drawn up was red hot. The smoke and heat continued from day to day until they were at last unbearable, and we were obliged to leave the ship. The crew wanted to leave earlier lest the flames should burst out, but the captain stayed as long as it was possible. We made all the sail we could to return to Barbadoes; but we were very far from land. Nothing could have been done, in my judgment, to save the ship. She sunk in about five or six hours after we cast off from her. We saw her go down. We were nearly four days in the boats when we were picked up and brought to New York. I cannot give any opinion as to the cause of the fire.

(Signed) ALPHONSE CÔTÉ.

(Signed) E. M. ARCHIBALD,
H.B.M. Consul General,
President.

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OCTAVE CÔTÉ, being further examined, saith: The cargo was shipped at Liverpool on account of the owners of the ship, through their agent. I am not aware of any regulations in regard to the loading cargoes of coal for long voyages, or for any voyages. About five years ago I commanded a barque in which we carried a cargo of coals from Liverpool to Havana. It was shipped in the Bramley Moore dock. Our voyage lasted about 50 days. The coals were delivered at Havana in good order. I have carried coals from Cape Breton to the West Indies, but the voyages were of short duration. In my late voyage the hold was ventilated by having off half of the fore hatch, as I have stated; sometimes, when the weather was fine, I had the quarter hatch off also. Before the discovery of fire, we did not notice any settlement of the cargo; but afterwards, we observed that the coals settled down. We considered that this was owing to the fire in the body of the coals below making more space. We had a very rough night after we took the boats, and shipped a good deal of water. We could get no rest or sleep. As far as I could judge, there must have been nearly 6 feet of water in the hold of the barque when we quitted her. She had the appearance of being waterlogged.

(Signed) OCTAVE CÔTÉ.

(Signed) E. M. ARCHIBALD,
H.B.M. Consul General,
President.

Finding of the Court.

From the evidence in this case it appears that the "Aurelie," a wooden ship of the registered burthen of 548 tons, six years old, in good order and condition, having been recently repaired and newly coppered, took on board a cargo of bituminous coal at Liverpool about the 14th of April last. The quantity shipped was 701 tons. It was taken on board during two days, when the weather was fine and dry. The ship was not fully loaded, it being testified that she could have carried 150 tons more. The coal was loaded in bulk on the skin of the vessel, without any artificial provision for ventilating the cargo. The ship sailed from Liverpool on the 16th of April "for Barbadoes and a market," and arrived at Barbadoes on the 31st of May, having had fine and moderate weather throughout. She lay at Barbadoes for 20 days, during which time the master, after communicating with various West Indian ports, and finding no market for the coal, received orders from his owners to proceed to Montevideo, for which port the ship consequently sailed from Barbadoes on the 20th of June.

She pursued her voyage with moderate weather until the 1st August, when, owing to the effect of the trade winds, she had reached 30° 16′ W. longitude, and 16° 39′ N. latitude.

On the evening of this day, the second mate having reported that he suspected the coals to be on fire, owing to an unusual odour of gas, a hole was digged in the coals, which, at the depth of 2 feet, were found to be greatly heated.

On the following morning a rod of iron being driven down through the coals to the depth of 11 feet, was allowed to remain two hours, when, on being drawn up, the middle part of the rod was found to be red-hot. The ship was then steered for Barbadoes, and all sail made to reach, if possible, that port. Day by day the smoke and heat from the coals increased; the cabin became uninhabitable; the pitch in the deck-seams boiled, and the beams and lining of the ship below were, from the nature of the smoke, evidently burning.

Meantime the ship was kept under a press of sail, steering for Barbadoes, while the boats were provisioned and fitted for quitting her in case of necessity. When the fire was discovered on the 1st of August the master ceased pumping the ship, in order to allow the water to rise and thus possibly extinguish the fire. The hatches were for a day or two closed, but afterwards partly opened to obviate an explosion of gas. On the 7th August, at noon, the ship was pumped dry, and on subsequently sounding the well at 4 p.m., 3½ feet of water were found in it, showing that the ship's side must have been burnt through. At 5 p.m., she began to settle, there being nearly 6 feet of water in her hold, and the heat and smoke being also intolerable. The master and crew embarked in the boats and lay by the ship until 9 p.m., when she sank and went to the bottom.

Together with the master and crew in the boats was the wife of the master, in a very delicate state of health, and their little daughter two years old. They were then at a distance of more than 1,500 miles from the nearest land, and the boats keeping together were steered towards Barbadoes. After nearly four days of hardship and loss of rest they were fallen in with and rescued by the American ship "Moonlight," bound from Batavia to New York, and conveyed in that ship to this port.

In reviewing the evidence we find that, during the voyage out to Barbadoes, the vessel made not more than three-quarters-of-an-inch of water per hour, and less than that quantity per hour after leaving Barbadoes.

That the water could hardly have reached the coals, as the ship was regularly pumped. The moisture from the bilge-water would, however, be absorbed by the coals, and the only ventilation, if it can be called such, of the cargo, consisting in leaving a portion of the fore hatch open, spontaneous ignition of the coal naturally ensued, resulting in the loss of the ship. Such a result was obviously natural, when it is considered that the coal had been on board of this ship for very nearly four months, and during nearly three months of that time continuously within the tropics. If, as is usually the case in ships carrying coals on a voyage likely to extend over three months, a provision had been made for ventilating the cargo by means of wooden boxes or tubes penetrating the coals, the ignition in this case would probably have been prevented; and as this ship's cargo was not to be certainly landed at Barbadoes, but was shipped for that port "and a market," which, as it turned out, required her to proceed to the distant port of Montevideo, we are of opinion that some sufficient means of ventilating the cargo, and allowing the gases to escape, should have been supplied at the time the cargo was taken on board. It does not appear upon whom the duty of making such a provision devolved; and it was probably not taken into consideration by anyone connected with the ship or cargo. Having regard, however, to the circumstances of the loss of this ship, we deem it important that ships carrying cargoes of bituminous coal to distant ports, or on voyages likely to extend over 30 days, and especially when bound for tropical regions, should be loaded under official inspection, and subject to the compulsory adoption of such appliances for ventilating the cargo as may be best calculated to obviate the danger of spontaneous combustion.

Under the circumstances in which the master found himself placed when the coals were discovered to be on fire, we think he conducted himself with skill and courage. His determination, indeed, not to quit the ship so long as there was a possibility of bringing her to port was creditable to him, and was carried almost to the verge of rashness; for on the last two days, when the ship was excessively heated, the fire might have burst forth at any moment, wrapping the ship in flames and imperilling the lives of those on board.

(Signed) E. M. ARCHIBALD,
H.B.M. Consul General,
President.

L.S.

(Signed) THEODORE COOK,
Commander R.M. "Russia."

(Signed) W. WALKER,
Master, ship "Greenock."

New York,
September 3rd, 1875.

"SENATOR," of Windsor, N.S., of 1,101 tons register, sailed from Philadelphia on the 8th June 1875, for Panama, with a cargo of coals.

EXAMINATION on OATH, instituted by Receiver of Wreck at the Port of Liverpool in pursuance of the 448th Section of the Merchant Shipping Act, 1854, 17th and 18th Victoria, cap. 104.

WILLIAM ADAMS, being duly sworn, deposes as follows:

That he was ordinary seaman of the ship "Senator," of the port of Windsor, N.S.

That the crew consisted of 17 hands, including deponent.

That the ship had on board a cargo of coals.

That said ship had on board, in addition to the cargo aforesaid, three passengers, master's wife and two children.

That the said ship proceeded from Philadelphia.

That at the time of sailing as above the said ship was in good condition and well found. There were ventilators in each hatchway, which came up about level with the deck, but when the hatches were closed there was no ventilation.

That the said ship was bound for Panama.

That the said ship proceeded on her said intended voyage as above stated, and we had fine weather until we approached Cape Horn, and all the hatches were kept open. We had bad weather all the while we were rounding Cape Horn, and the hatches were all battened down when in the Pacific ocean. About 8 o'clock one evening I heard the ship was on fire, and went aft. A hole was made in the fore cabin on port side, and water was played down it with

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the force pump. All hands were on deck all night, and on the following morning the smoke disappeared. We continued, however, to send water down. In the evening of that day the smoke again came up from the ventilator in after hatch. We then poured water down through the hole in the cabin, and also through the after hatch, but the smoke continued, and two or three days afterwards ship was kept away before the wind and ultimately anchored in the Straits of Magellan in smooth water. There was then fire on the port side, and cabin was full of smoke, and we all left her in two boats as soon as possible after coming to anchor. The captain's wife died on the way up to Sandy Point, and after remaining there some time we all left by the s.s. "Liguria." At Monte Video we landed four seamen, and at Rio the first and second mates, and remainder came on to Liverpool.

That the above contents are in all respects correct and true to the best of deponent's knowledge and belief.

(Signed) WILLIAM ADAMS.

Sworn at Liverpool this 17th day of November 1875, before me,

(Signed) W. H. COULSTON, Receiver of Wreck.

(Signed) EDMUND H. VERNEY, Commander R.N.

CHARLES DE FLEURY, being duly sworn, deposes as follows:---

That he was able seaman of the ship "Senator," of the port of Windsor, N.S., of the register tonnage of 1,101 tons.

That the said ship was rigged as a barque; that she was built of wood.

That the crew consisted of 17 hands, including deponent.

That said ship had on board a cargo of between 1,600 and 1,700 tons of coal shipped at Philadelphia for Panama.

That said ship had on board, in addition to the cargo aforesaid, three passengers, viz., master's wife and two children.

That said ship proceeded from Philadelphia on her intended voyage, as named below, on the 8th day of June last past.

That at the time of sailing as above the ship was in good condition and well found in every respect. Her draught of water was 21 feet. There were ventilators below the hatches, but when off Cape Horn we experienced bad weather, and the hatches were not taken off for a month.

That the said ship was bound for Panama.

That the said ship proceeded on her intended voyage as above stated and when off Cape Horn, during my watch below, a seaman was washed overboard and drowned.

That on Monday the 13th day of September, at 8 p.m., the weather variable and the wind in the westward, blowing a very strong breeze, with a heavy sea from the westward, the said ship was standing to the northward when one of the crew came forward and said the ship was on fire. Just after, the captain called all hands aft to pump water into the ship. When I went into the cabin smoke was issuing from the port quarter between the timber into the cabin, and the captain ordered the carpenter to cut a hole through the lining of the ship on the port side, through which we pumped water all night. On the morning of the 14th the smoke disappeared from the cabin, but was coming up through the ventilator in the after hatch, and we continued to throw water inside the lining of the ship where the fire was supposed to be. The smoke was confined to the after part of the ship. We drew the pump boxes to allow the water to run down through them. On the 15th we commenced to throw cargo overboard, but although we could not reach any fire some of the coals near the beams were consumed and large quantities of smoke and gas continued to ascend, so that it was difficult to work there. On the evening of the 16th the captain stood to the eastward for the Straits of Magellan. We had quite a gale of wind and we run her under topsails (the upper ones being reefed) reefed spanker and jib. About 7 a.m. on the 17th September we anchored about seven miles in the Straits of Magellan, abreast of Cape Pillar, at which time the smoke in the cabin was so dense that we could not enter. We immediately left the ship and landed near Cape Pillar, and about half an hour after she burst into a flame aft. The next day we left Cape Pillar and proceeded up the Straits, having scarcely any provisions. On the morning following the master's wife died, and on the following Saturday night we reached Sandy Point. The master, his two children, and eight of the crew came to Liverpool by the steamship "Liguria," arriving here on Saturday the 13th November about 4 p.m.

That in consequence of the casualty to the said ship two lives were lost, one washed overboard, one died from exposure, the remainder, 18, being saved by our own boats.

That the above contents are in all respects correct and true to the best of deponent's knowledge and belief.

(Signed) CHARLES DE FLEURY, Deponent.

Sworn at Liverpool this 17th day of November 1875, before me

(Signed) EDMUND H. VERNEY, Com. R.N., Receiver of Wreck.

"CLEVEDON," of Liverpool, an iron ship of 698 tons register, seven years old, and classed A1 at Lloyd's.

NAVAL COURT of INQUIRY on the burning and abandonment of the British barque "Clevedon," official No. 60086, of Liverpool, held at the British Consulate, Valparaiso, on the 4th day of October 1875.

(Signed) J. DE V. DRUMMOND HAY, H.B.M. Consul and President.

British Consulate, Valparaiso, 6th October 1875.

SCHEDULE of Enclosures, transmitted with letter dated 6th October 1875, from H.B.M.'s Consul at Valparaiso. President of a Naval Court held at Valparaiso on the 4th day of Ocrober 1875.

Letter.	Nature of Document.
	Minutes of Proceedings.
A.	Orders summoning the court.
B.	Deposition of master.
C.	Deposition of first mate.
D.	Deposition of second mate.
E.	Deposition of steward.
F.	Deposition of carpenter.
G.	Deposition of the crew.
H.	Finding of the court.
I.	Extract from official log of "Foxhound."
J.	Official log of "Clevedon," containing the written statement of the master.

MINUTES of PROCEEDINGS taken at a Naval Court of Inquiry held at the British Consulate, Valparaiso, on the 4th day of October 1875, to investigate the causes of the burning and abandonment of the British barque "Clevedon," official No. 60086, of Liverpool, on the 21st September 1875.

PRESENT:

President:

JAMES DE VISMES DRUMMOND HAY, C.B., Her Brittanic Majesty's Consul.

Members:

Lieutenant JOHN DEANE DEANE, of Her Majesty's ship "Tenedos."

MR. WILLIAM HARRIS. Master of barque "Maida," of London.

Clerk of the Court:

MR. THOMAS OWEN JOYNSON, Paymaster of H.M.S. "Tenedos."

The master of the barque "Clevedon," DAVID HUGHES, with the first mate, second mate, carpenter, and 11 men lately forming the crew of the vessel, and named severally:

William Royce, first mate.
James Barnes, A.B.
Frederick Broom, ordinary.
Henry Boyes, second mate.
Frederick Henrickson, A.B.
A. W. Hignett, apprentice.
Benjamin Ouset, carpenter.
James Hands, A.B.
Charles Maughan, steward.
Angus Sutherland, A.B.
John Hartgreaves, sailmaker.
Joseph Dromedius, A.B.
William Morgan, A.B.
Edward Jacobson, A.B.

Absent:

Nicholas Demetrius, A.B.
Herbert Morley, A.B.
Walter Gilbert, ordinary.

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Order summoning the court read in the presence of all the witnesses and the members of the court and clerk of the court sworn in.

Witnesses were then ordered to retire from the Court, except the first, David Hughes, master, whose certificate of competency, No. 88,378, was laid on the table, as also those of William Royce, first mate, No. 96,187, and Henry Boyes, second mate, No. 26,557.

David Hughes, being called on by the court to make a statement of how the burning and abandonment of the vessel occurred, laid before the court a written statement, contained in the official log book, which was read and signed by deponent, the first and second mates, sailmaker, and a number of the crew, and ordered to be annexed to
Annex J. the proceedings, and is marked J.

David Hughes was then examined, and in answer to questions put by the court replied as put down in the
Annex B. annexed deposition marked B.

An extract from the official log of the British barque "Foxhound," of Swansea, official No. 58090, duly signed by James Halliday, the master, and John Evans, mate, was read and ordered to be annexed to the proceedings,
Annex J. and is marked J.

William Royce, first mate of the barque "Clevedon," was next called before the court, and in presence of the master was examined, and stated as set down in deposition marked C.

Annex C. Henry Boyes, second mate of the barque "Clevedon," was next called and in presence of the master was examined, and stated as set down in deposition marked D.

Annex D. Charles Maughan, steward of the barque "Clevedon," was next called before the court, and in the presence of the master was examined, and stated as set down in deposition marked E.

Annex E. Benjamin Ouset, carpenter of the barque "Clevedon," was next called before the court, and in the presence of the master was examined in French by the president, and stated as set down in deposition marked F.

Annex F. The members of the crew, and named severally—

John Hartgreaves, sailmaker,
William Morgan, A.B.,
James Barnes, A.B.,
Frederick Henrickson, A.B.,
James Hands, A.B.,
Angus Sutherland, A.B.,
Joseph Dromedius, A.B.,
Edward Jacobson, A.B.,
Frederick Broom, ordinary,
A. W. Hignett, apprentice,
Herbert Morley, A.B.,
Walter Gilbert, ordinary,

were then called together before the court and examined in the presence of the master, and deposed as set down in annexed deposition marked G.

Annex G. The court was then cleared, and the members proceeded to deliberate and frame their opinion and finding, which was written out, and, being duly signed, is annexed to the proceedings and marked H.

Annex H. The court was then re-opened, and the finding of the court was read over in the presence of the master, mates, and crew of the late barque "Clevedon."

The certificates of the master, as also of the first and second mates, were returned to them.

The court was then closed, and the proceedings terminated at 5.30 p.m.

(Signed) J. de V. Drummond Hay,
H.M. Consul and President.

Annex A.

By Edwin John Pollard, Esq., captain of Her Majesty's ship "Tenedos," senior naval officer present at Valparaiso, being the officer empowered to order naval court by the Merchant Shipping Act, 1854.

To

James de Vismes Drummond Hay, C.B., Her Majesty's Consul at Valparaiso, as pres
John Deane Deane, Esq., lieutenant of Her Majesty's ship "Tenedos;"
William Harris, Esq., master of the British ship "Maida;" as members.

Whereas the master and 17 men belonging to the British barque "Clevedon," of Liverpool, official No. 60086, have arrived at Valparaiso, and have reported that the said vessel was burnt and abandoned at sea on the 21st September last:

And whereas I consider it requisite that a naval court should investigate the cause of said loss and abandonment: I do hereby order and direct you to assemble together to form a naval court at the British Consulate on the 4th day of October 1875, to inquire into the causes of the loss and abandonment of the aforesaid vessel, such court being hereby ordered to investigate the same.

Given on board Her Majesty's ship "Tenedos" at Valparaiso this 2nd day of October 1875.

(Signed) E. J. Pollard,
Captain and Senior Officer.

Annex B.

Examination of David Hughes, Master of the late Barque "Clevedon," of Liverpool, official No. 60086.

A written statement of the occurence being annexed to the proceedings, deponent, in answer to questions put by the court, replied as follows:—

The ship was seven years old, and classed as A1 at Lloyd's, and is iron, 698 tons. The crew consisted of 18 men, all told. The cargo consisted of steam coal. The fire was first discovered on the morning of the 20th September 1875, in lat. 41° 52′ S., long. 78° 33′ W. Had two pumps on board, both in good order. The ship was well found in everything. The ship was ventilated by a ventilator on the quarter deck, and one on the house forward, and one on main deck into chain lockers. The coal was shipped at Liverpool by F. A. Widdows & Co. The chief mate received the cargo. I saw about 300 tons passed on board, and what I saw was dry and in good condition. I am unable to account for the fire. Had one tin of paraffin oil on board; it was stowed in the oil locker on deck; at commencement of the voyage it was there, but subsequently it was condemned as unfit for use, and stowed away in the store-room. This can was examined after the smell of fire was discovered, and found to be perfect without leakage.

(Signed) David Hughes,
Master.

Before me,
(Signed) J. de V. Drummond Hay,
Consul and President.

Annex C.

Deposition of William Royce, first mate of the barque "Clevedon," holding a certificate of competency, No. 96,187, as first mate.

This is my first voyage as first mate. The coal was received in dock; the latter portion seemed to be larger coal than that first received. I did not notice any portion of the coal being wet. It appeared to me all dry. The weather was fine and it did not rain. The vessel was trimmed in general from 2 to 4 feet from the main deck. The fore and aft hatches were taken off whenever we had fine weather. The vessel was also ventilated by three or more ventilators. When we first perceived the smell of fire it was suspected that the steward might have upset some paraffin oil, but on examination of the lazarette the can was found untouched, and showed no sign of leakage. There was one 10-gallon can on board. Over the fore hatch there was no smell, nor was the coal hot. The after hatch the same. In the cabin there was a slight smell. We had had heavy weather and the ship had taken in some water. Two days after the smell, the smoke came out of the foremost ventilator. The foremost hatch was taken up, the smoke was so great that it was battened down again; the same with the after hatch. Had no knowledge how long the coal had been in the lighters before shipment. I am of opinion that the vessel was not left too soon. The decks were blown up by the main and after hatches. From the time we first saw the smoke the boats were got ready on deck, and afterwards all hands were employed endeavouring to smother the fire with water. After going on board the "Foxhound," the vessel which saved us, I returned to the "Clevedon" at the master's wish, in order to see what I could save. I entered the vessel by the stern, but could not go further than the companion, the fire was so great. The last I saw of the "Clevedon" the main and mizen masts had gone overboard. The seat of the fire appeared to be on the port side of the main hatch, that is where I believe it originated, amongst the small coal.

In answer to question by master, witness deposed—

I believe the master did ask the steward whether he had been using paraffin oil; I think his answer was that he had not, as some time before he found he could not use the paraffin oil and used colza oil instead.

(Signed) William Royce,
First Mate.

Before me,
(Signed) J. de V. Drummond Hay,
Consul and President.

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Annex D.

DEPOSITION of HENRY BOYES, second mate of the barque "Clevedon," holding a certificate of competency, No. 26,557, as second mate.

This is my first voyage in this ship, and my first with the master, Mr. Hughes.

When I joined, a portion of the cargo was on board. I assisted in trimming a great portion of it below. It appeared to me to be dry. The large and small coal mixed. I know not the difference of steam coal and other coal at sight, but the cargo seemed to me to be all of one class. The first suspicion of fire was caused by a strong smell which seemed to be of paraffin oil, and search was made. The smell was perceived in the cabin and not in the fore part of the ship. This occurred on a Saturday, and on the Monday following we saw smoke and first became convinced of a fire on board. The hatches were battened down, and about two or three hours afterwards blew up, the main hatch going first, and through that hatch water was bucketed down. I do not think the vessel was abandoned too soon. I can give no opinion as to the cause of the fire, and have no suspicion of any foul play. The coal extended underneath the cabin deck. I went down on Saturday, the day of the smell, and examined that part of the cargo, but perceived nothing.

The smell was first perceived by the first mate, myself, and steward on the companion; the lazarette was further aft, below the after cabin where we had our breakfast, and where I had not smelt a smell.

(Signed) HENRY BOYES,
Second Mate.

Before me,
(Signed) J. DE V. DRUMMOND HAY,
Consul and President.

Annex E.

DEPOSITION of CHARLES MAUGHAN, steward of the barque "Clevedon;" being duly sworn, stated as follows:—

I belong to Weymouth and have been 32 years at sea; am 48 years of age. It is my first voyage with Mr. Hughes. I did not know the master before I joined the vessel. The stores of the ship were all in my charge. We had paraffin oil and colza oil on board for the lamps. I used the paraffin oil at first, but not burning properly, with the consent of the captain I used only colza. The can with the paraffin was stowed away in the lazarette and I had no occasion to touch it again, except once, and that was before we rounded the Horn, in order to get a little for the carpenter's use. When we perceived the smell on the 18th September, being afraid that the paraffin can might have been capsized, I went down to the lazarette, but found that notwithstanding the knocking about of the vessel, the can had not been upset and was tightly corked. I can form no opinion as to the cause of the fire except that it originated in the coals. I think the master quite right in having abandoned the vessel. I have no suspicion of foul play. The decks were burnt and blown up in three places before we left.

(Signed) CHARLES MAUGHAN,
Steward.

Before me
(Signed) J. DE V. DRUMMOND HAY,
Consul and President.

Annex F.

DEPOSITION of BENJAMIN OUSET, carpenter of the barque "Clevedon;" being duly sworn, stated as follows:

I joined the "Clevedon" at Liverpool. I am a native of France. On Saturday the 18th September the hatches were closed. On Monday morning the mate called me hurriedly to bring a hammer to open the hatches. On opening the hatches a great volume of smoke came out and the hatches were again closed. It was my duty every morning to oil and clean the worms or screw of the wheel. I used olive oil—I call it so, for so it was called to me, but you will understand I did not taste it. It was given to me by the first mate out of a tin can in the oil locker on deck near my berth. The oil for paint was kept in other cans, and larger, in the same locker. At one time when near or off the Horn I tried paraffin oil to clean the stays of the worm, I used it for several days. I got it from the steward who went down with me to the lazarette for it, and he gave me about half a pint; I used it for 8 or 10 days, but finding it was not good I told the captain of it, and at his desire I used lamp oil. When on the Friday previous to the fire I had, as usual on a fine day, opened the hatches, I did perceive a slight smell such as of petroleum, but very slight. I can form no opinion as to the cause of the fire; but with reference to the suspicion of the paraffin, I must say that it could not have caused the fire, for the following reasons. The seat of the fire was on the port side of the main hatch, between that portion of the ship and the main hatch there is a bulkhead partly of iron.

When I had battened the hatches and secured the ventilation tightly I kept a watch on the beams of the deck, and it is my opinion that the fire commenced in the upper portion of the cargo, for not only did I notice the deck bulging on the port side between the main hatch and the kitchen, and the pitch in the seams, melting, but when told by the captain to bore holes in the deck to let water through, I found the planks, which were originally 4 inches thick, to be burnt to the thinness of 1½ to 2 inches proving that the fire was on the surface of the cargo. The pumps of the ship sucked, but not freely, at 4½ inches. I consider the vessel had always 4½ inches in her. There were 18 inches between the keel and the ceiling in depth.

The ship was not abandoned until the fire had completely got possession of her. I had secured my tools, and, by the good fortune of the vessel which saved us, was enabled to save them. I lost some of my clothes, but saved my tools.

(Signed) BENJAMIN OUSET,
Carpenter.

Before me,
(Signed) J. DE V. DRUMMOND HAY,
Consul and President.

Annex G.

DEPOSITIONS given by the Members of the Crew named severally, as follows:—

John Hartgreaves, sailmaker,
William Morgan, A.B.,
James Barnes, A.B.,
Fredk. Henrickson, A.B.,
James Hands, A.B.,
Angus Sutherland, A.B.,
Joseph Dromedius, A.B.,
Edward Jacobson, A.B.,
Fredk. Broom, A.B.,
A. W. Hignett, Apprentice,
Herbert Morley, A.B.,
Walter Gilbert, Ordinary;

who did severally and together declare that they had no complaint to make; that they had no suspicion as to the cause of the fire, beyond its being caused by the coal; that the master did not leave the vessel until the fire had rendered it impossible to remain any longer in her; that they saved little or nothing of their clothes; that the master exerted himself in preparing and provisioning the boats; and that they were fortunately saved by the "Foxhound," on board of which vessel they were well treated until their arrival at Valparaiso.

Before me,
(Signed) J. DE V. DRUMMOND HAY.
Consul and President.

Annex J.

EXTRACTS from the Official Log of the British barque "Foxhound," of Swansea, official No. 58090.

At Sea, September 18, 1875,
Lat. 47° 00′ South, long. 80° 30′ W.

The "Clevedon" barque, of Liverpool, passed close by us steering northward.

(Signed) JAMES HALLIDAY,
Master.
,, JOHN EVANS,
Mate.

Septr. 21, 1875, 4.30 a.m.,
Lat. 40° 10′ South, Long. 77° 00′ W.

Made out a vessel to windward burning blue lights. I then hauled my ship to the wind and came to within hailing distance, when the said vessel proved to be the "Clevedon," of Liverpool, with cargo on fire, and the master asked me to lay by him, which I did until daylight, when I saw volumes of smoke and flame ascending from the hatchways, and the fire seeming to increase very rapidly. At 7 a.m. the master and crew came on board my ship in their boats. I then bore away and passed close under her stern and saw that her main deck was in a blaze. After the chief mate and four hands revisiting the ship, and seeing that nothing further could be done, and shortly afterwards seeing the main and mizen masts fall over the

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side, I then made sail and proceeded on my course as nothing more could be done.

(Signed) JAMES HALLIDAY, Master.
„ JOHN EVANS, Mate.

True copy.
(Signed) J. DE V. DRUMMOND HAY.
Consul and President.

Annex H.

Finding of the Court.

At a naval court of inquiry assembled at the British Consulate, Valparaiso, on the 4th day of October 1875.

PRESENT:

President.

JAMES DE VISMES DRUMMOND HAY, C.B., Her Britannic Majesty's Consul.

Members.

Lieutenant JOHN DEAN DEANE, of Her Majesty's Ship "Tenedos."

Mr. WILLIAM HARRIS, Master of Barque "Maida"

Clerk to the Court.

Mr. THOMAS OWEN JOYNSON, Paymaster H.M.S. "Tenedos."

The court, pursuant to an order from Edwin John Pollard, Esquire, captain of Her Majesty's ship "Tenedos," and senior naval officer present at Valparaiso, proceeded to investigate the circumstances attending the burning and abandonment of the British barque "Clevedon," of Liverpool, Official No. 60086. And having deliberately weighed and considered the evidence and observations preferred by the master and the men, late members of that crew, who have appeared before the court: The court is of opinion that the statement made by the master of the barque "Clevedon," that the vessel was abandoned on fire at sea, is correct. That such fire had its origin in the spontaneous combustion of the coal. That the master, Mr. Hughes, his officers and crew, appear to have performed their duty to the utmost of their power to save the vessel; and that no blame can be to them attached for the casualty.

The court, therefore, has much pleasure in returning to the said master his certificate, as also to the first and second mates their certificates.

Further the court desire to express their opinion that had the "Clevedon" been supplied with force pumps or other appliances for extinguishing a fire, there might have been a greater chance of preserving the vessel, and that the provision of such appliances should be obligatory on all vessels.

(Signed) WM. HARRIS.
„ JOHN D. DEANE.
„ J. DE V. DRUMMOND HAY.
(Signed) THOS. JOYNSON,
Clerk to the Court.

"RIVER BOYNE," barque of Liverpool, iron ship of 498 tons register, eight years old, classed A1 Lloyd's.

From the Wreck Report it appears that she sailed from Liverpool on the 15th July 1875, for Valparaiso, with 776 tons of coal.

No means of ventilation beyond keeping the hatches off.

Part of the cargo burnt owing to spontaneous combustion on October 12th, 1875, part of cargo (about 60 tons) thrown overboard, put back to False Cape Horn, when vessel was anchored; but finding fire could not be extinguished, master put the vessel close in shore and scuttled her by letting in water through decks, extinguished fire, raised the vessel and proceeded on voyage; arriving at Valparaiso on 27th November, where cargo has been sold and vessel undergone slight repairs.

A protest was received from H.B.M. Consul at Valparaiso by the Board of Trade, who forwarded to the Commission the following extract:—

EXTRACT from the PROTEST of the British Barque "River Boyne," of Liverpool, Official No. 55,054.

That on the 15th of July they, the said appearers, left Liverpool in and with the said barque "River Boyne," laden with a cargo of coals and bound to this port of Valparaiso. That nothing worthy of note occurred until the 8th of October, from which date they experienced heavy weather, and the vessel laboured and rolled, shipping much water. That from the 8th October the hatches had been kept closed, on account of the heavy weather, until the 12th October, when they removed the fore hatch and found smoke issuing from the hold.

That all hands were set to work to extinguish the fire, and for that purpose they were obliged to throw overboard a portion of the cargo for the benefit of all concerned. That in spite of their endeavours the fire increased rapidly, and on the 13th October they deemed it prudent to run for an anchorage. That they accordingly battened down all the hatches and made for the land. That the smoke continued to issue in volumes from under the tarpaulins. That at 1.30 p.m. on the 14th October they arrived in a small bay near False Cape Horn. That they anchored the vessel fore and aft, and immediately took measures to extinguish the fire by making holes in the decks, flooding them with water, and pumping down the hold. That at 5 p.m. there were 7 inches of water in the hold. That at 8 p.m. the crew refused to continue working, complaining of want of rest. That the officers and carpenter continued flooding the hold until 4 a.m. on the following morning, and at 5 a.m. all hands again turned to. That the fire increased, and their efforts were unavailing. That at 6 p.m. there were 5 ft. 6 ins. of water in the hold. That during the night all hands were divided into two watches, and the head pump and main pumps were kept going, and the decks were kept flooded with water. That the cabin and forecastle were so full of smoke that all hands had to remain on deck. That at 6 a.m. on the 16th October there were 6 feet of water in the hold. That they took off the after hatch, and finding very little smoke they proceeded to dig the coals out to trim the ship more by the head, and also in order to get at the fire, which appeared to be on the fore side of the main hatch. That they threw overboard about 30 tons of coal for the benefit of all concerned. That at 4 p.m. the smoke drove the men from below and constrained them to close the hatch, and although the coal was quite cool as far as they had dug, the fire increased rapidly. That they did not cease flooding the coal, and at 8 a.m. on the 17th October there were 8 ft. 10 ins. of water in the hold, and the ship was down to the hawse pipes and scuppers in the water. That they removed the main hatch, but found the smoke denser than ever, and they were constrained to batten it down again. That after due consultation with his officers the master determined, for the safety of the ship and cargo, and the interests of all concerned therein, to scuttle the vessel. That after examining the shore and putting the vessel in position they beached the ship on the W.N.W. side of the bay, abreast of a stream of water, on a smooth sandy bottom, void of rocks. That they then proceeded to scuttle the ship by letting the water into the forecastle through the side lights, and the carpenter drove rivets out of the bulkhead of the fore compartment to assist the sluices in flooding the hold. That at noon the tide fell and left the vessel laying quiet and quite upright on the sand. That at 4 p.m. the tide rose and filled the vessel to 13 feet. That the smoke continued issuing from below, and all were kept at work flooding the decks. That they experienced hard gales of wind, but that the bay was perfectly sheltered from the heavy sea. That at 6 a.m on the 18th October the tide rose and filled the ship fore and aft, covering the main deck as far as the fore part of the main hatch. That there were 3 feet of water in the cabin, the coals being completely covered and the fire extinguished. That at 8 a.m. the tide fell clear of the hawse pipes and scuppers and all hands were employed at the pumps and the carpenter proceeded to plug up the hawse pipes and every aperture in the bulwarks and decks. That the wind continued to blow a strong gale from the S.W. That at 6 p.m. it was high tide and the water rose just above the hawse pipes but none entered the vessel. That the pumps were kept going all night. That at 6.30 a.m. on the 19th October the tide rose high and completely filled the vessel again. That at 9 a.m. the tide fell and the men returned to the pumps. That the weather continued boisterous. That at 6.30 a.m. on the 20th October the tide rose and flooded the vessel's decks again, but little or no water entered the hold. That they lightened the vessel by throwing cargo overboard into the sea out of the main hatch, for the benefit of all concerned, and that the pumps were kept constantly at work. That they got the tow line out and endeavoured to bend it, but were unable to do so on account of the strong gale, which also prevented them from pumping that night. That at 5 a.m. on the 21st October the pumps were again set at work. That at 7 a.m. the tide rose to the scuppers. That they ran out the tow line and 15 fathoms of chain, and shackled it on to the outlying cable which had been slipped. That at midnight the weather moderated. That there were 10 feet of water in the well, and at 6 a.m. on the 22nd October there were 8 feet of water in the hold. That at 7.30 a.m. the ship floated

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without any perceptible motion. That the weather was fine and moderate. That they hove on the tow line and got the ship out to her former position in 6 fathoms of water, with 60 fathoms on the port cable and 25 fathoms on the starboard cable, the ship being by the head, and the hawse pipes just clear of the water. That the pumps were kept constantly at work. That during the time the vessel was aground the lowest water round the ship was 10 ft. 8 ins. That at noon there was 1 ft. 9 ins. of water in the well. That the vessel did not leak. That at 6 a.m. on the 24th October they trimmed the coals from forward to the after part of the ship, and bailed out the fore compartment, the sluice being choked. That the water in the tanks was rendered useless, and had to be renewed from shore. That the pumps were kept constantly at work, and at 8 p.m. there were 7 inches in the well, which they pumped out. That at 6 a.m. on the 25th of October they continued trimming the ship. That they bailed the fore peak dry, and otherwise proceeded to get the vessel ready for sea. That at 7.30 p.m. they found 10 inches of water in the well, and pumped it out. That they continued making the ship ready to sail. That at 10 a.m. on the 26th October the American schooner "Golden West," of New London, came into the bay and anchored for an hour in order to offer assistance to the "River Boyne." That they weighed the stock of bread, and found there were 450 pounds fit for use left. That all the ship's provisions were more or less damaged, and a great portion of them was entirely destroyed by the salt water. That they prepared everything in order to set sail the first opportunity. That the weather continued boisterous until the following day, the 29th October, when they proceeded on the voyage. That the total amount of cargo thrown overboard was about 60 tons. That nothing further worthy of note occurred, and they arrived and anchored in this port of Valparaiso on the 27th day of November, on which day a survey was called on the condition of the vessel and cargo, and the instructions of the surveyors are now being carried out.

"LE BARON" of Liverpool, wooden vessel, 889 tons register, 6 years old.

From the Wreck Report it appears that she sailed from Hull on the 16th August 1875 for Valparaiso, with 1,378 tons of coal.

Was burnt at sea about 30 miles north of Cape Horn, owing to spontaneous combustion of coal cargo.

"BEUCLEUCH" of Alloa, iron ship of 1,350 tons register, 1 year old, classed A1 Lloyds'.

From the Wreck Report it appears that the "Beucleuch" sailed from Greenock the 18th August 1875, for Bombay, with 1,781 tons of coal.

Ventilated by means of four patent ventilators and usual hatches.

Partial lost of cargo and damage to vessel caused by spontaneous combustion of coals. On the 22nd November, in lat. 8° N., long 68° E., smoke and gas were observed to be issuing from the foremost part of the main hatch. The steam fire engines were set on and for four days played down the ventilator.

The hatches were then battened down, the hose continuing to play into the hold. After four hours the hatches were removed, the gas appearing to have greatly accumulated; coal was discharged from main hatch to the fore and after hatches until they were full. A large amount of water having been pumped below, about 200 tons of cargo was jettisoned from between decks. On the fourth day, the fire increasing, all hands were compelled to withdraw from the main hatch. Four rivets were now driven out from under water line to save the ship, there being at the time 7 feet water in the hold. At about 4 a.m. next day the water had increased in the hold to 10 feet, and the fire was extinguished. The holes were then stopped, sluices shut, pumps set on, and at 5 p.m. on the 27th November the pumps sucked. Trimmed ship upright, she had taken a slight list on transferring the coal, and resumed voyage, arriving safely at Bombay on the 5th December last.

"SAN RAFAEL" of Liverpool, wooden ship of 955 tons register, about 13 years old, re-classed at American Lloyds' A1 in September 1875.

From the Wreck Report it appears that she sailed from Liverpool the 18th September 1875, for Valparaiso, with 1,300 tons of coal.

Was ventilated by means of a ventilator in each hatch.

The vessel had arrived in the above-mentioned latitude and longitude all well. The second mate was in charge with the starboard watch on the morning of the 2nd January last. At 7 a.m. the sailmaker called the chief officer and stated that smoke was issuing from the forehatch, the second mate having been below previously for some lashings. The master was called, and after consultation the hatch was replaced and the vessel continued her course. At noon smoke was observed issuing from the after-hatch ventilator. The hatch was removed and the cargo found to be on fire. All hatches were now immediately battened down and the vessel was put about to return to the Falkland Isles. At about 10 p.m. on the 3rd January she had run back about 260 miles when an explosion suddenly occurred, blowing off the main and after hatches and displacing the bulkhead in the cabin. A part of the crew were now directed to prepare the boat, the remainder directed to the fire engine, and a large quantity of water was thrown down upon the cargo, but without avail. At about 10.30 p.m. a second explosion occurred and flames burst up the hatchways. The boats were got out and provisioned, explosions occurring from time to time. At 4 a.m. the 4th January, there being an immense body of fire in the vessel, it was determined to abandon her, the master, the master's wife, the carpenter, four A.B. seamen, and three apprentices got into the longboat. The first mate, cook, steward, sailmaker, and three A.B.'s got into the lifeboat. The second mate, the third mate, two A.B.'s and an apprentice got into the gig. The boats remained by the vessel until 8 a.m., when the weather freshening it was deemed advisable to pull to land. After about four hours the longboat got separated from the two other boats and has not since been heard of. At 2 a.m. on the 5th January the lifeboat and gig arrived at a small uninhabited island inside the Isle d'Alfonso, where water and shellfish were procured. The boats proceeded to sea, returning from time to time to the island for shelter in bad weather, searching along the coast for the longboat, and on the lookout for passing vessels. After 20 days the cook succumbed from exhaustion and was buried on the island. Seven days later, on the 31st January, the lifeboat and gig being at the time about 20 miles S. of Diego Ramirez Islands, a ship which proved to be the "Yorkshire" hove in sight and was signalled. She bore down and the hands from the two boats, 11 in number, got safely aboard. They were treated with great humanity and kindness by all on board the "Yorkshire," and arrived safely in London at 2 a.m. this day. The casualty appears to have been caused by spontaneous combustion.

"THERESA" of London, wooden ship, of 705 tons register, 18 years old, classed at French Lloyds' 5/5 1–6–5 years.

From the wreck return it appears that she sailed from Liverpool on the 25th September 1875, for Rangoon, with 920 tons of coals.

The ventilation, as described by the master, appears to have been complete.

Burnt at sea, about 70 miles west of Cape of Good Hope, by spontaneous combustion of cargo of coals.

"FANNY," barque, of Sunderland, 397 tons register.

Sailed from Swansea, bound to Valparaiso, with a cargo of coals.

When off Valparaiso, on 23rd December 1875, was found to be on fire from spontaneous combustion of cargo; she put into Coquimbo, where with assistance from H.M.S. "Nercus" the fire was got under and the cargo discharged, when she was found much burnt on starboard side by main rigging planks being nearly burnt through, in places to ½rd of an inch; was repaired, and left Coquimbo 9th April.

The following letter, received by the Board of Trade from Her Majesty's Consul at Coquimbo, relative to the cases of the "Mabel" and "Fanny," has been received by the Royal Commission from the Board of Trade:—

British Consulate,
Coquimbo, 4th May 1876.

SIR,

I HAVE the honour to enclose Vice-Consul Mark's report on the accident to the 'Mabel,' of Bristol, by fire at Caldera in December last.

"On 31st December and 13th April last, I reported the 'Fanny' O. N. 47667, which put in here on fire, which was extinguished, the vessel repaired, and sailed on 9th ultimo.

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"It is worthy of remark that both vessels loaded at Porthcawl, Swansea, both bound for Valparaiso.

"The 'Mabel' arrived and remained a day or two, and the day she left for Caldera to discharge, the fire was discovered; the cargo of the 'Fanny' was discovered to be on fire when in sight of Valparaiso.

"I venture to suggest, from what I have experienced and heard, that if iron bars were placed vertically in different parts of the coal they would tend to throw off the heat, or at least serve as thermometers or guides to find out where the fire is."

I have, &c.
J. GRIERSON,
H.B.M. Consul.

The following REPORTS of STATUTORY INQUIRIES held by the Board of Trade into cases of GAS EXPLOSIONS on board Coal-laden Vessels since 1868 have been forwarded by the Board of Trade to the Royal Commission for inquiring into Causes of Spontaneous Combustion of Coal in Ships.

THE "ZENO."

Board of Trade Inquiry into the total loss of the "Zeno," held at the Police Court, Borough of Kingston-upon-Hull, 11th June 1873.

Before WALTER WRANGHAM, ESQ., Police Magistrate.
CAPTAIN WHITE, R.N.
WILLIAM DARLEY, ESQ., Naval Architect.

Mr. Saxellye appeared on behalf of the Board of Trade.
Mr. John Hearfield appeared for the owners, Messrs. Thomas Wilson, Sons, and Company, and the Master, Edwin Owen.
The Master's and Chief Officers certificates were handed in.

Official number of ship, 65252. No., date, and port of registry, $\frac{72}{1871}$, Hull; screw. Built at Hull in 1871 by Earle's Shipbuilding and Engineering Company, Limited, Hull. One deck and poop; two masts, brig rigged; Clench built; length, from fore part of stem to aft side of head of stern post, 272 ft. 6 tenths; depth in hold, from tonnage deck to ceiling, 17 ft. 7 tenths; gross tonnage, 1,490·21; registered tonnage, 1,163·96.

THOMAS BOOTH, of 14, Brook Street, Hull, late second mate of the S.S. "Zeno." I joined the ship in November 1872. In December last I was promoted to be second mate, and was second mate at the time of the accident. I believe the ship was a first-class ship; hailed from Hull; was manned by 29 or 30 hands, all told; she was brig-rigged. She carried six boats—two lifeboats, two large boats carried on the bridge, a gig, and a jolly boat. In the early part of May last the vessel was in the Penarth Dock at Cardiff where we took in a cargo of coals about 1,900 or 2,000 tons. I believe they were steam coals. We completed the loading at 1 a.m. on the 10th of May 1873. We got out of dock between 4 and 5 p.m. on the same Saturday afternoon, there being then a dense fog at the time. We went into the Penarth Roads, and laid there until Sunday morning. I believe we got under weigh about 3 a.m. The vessel proceeded slowly in consequence of the fog. The fog continued until the Monday afternoon. At 6 a.m. on the 12th May the vessel was stopped to take soundings, and the course was then shaped to Cape Finisterre. When the fog cleared away and we proceeded at full speed. We had some sail set, and it was so set until the morning of Tuesday, the 13th May, when the accident occurred. At 8 a.m. on the 13th May (Tuesday) I was relieved by the chief mate, the weather being fine, going at full spead, and being under steam and sail. I went below, had my breakfast, and went to my berth; was reading in my berth, which is down below amidships, against the entrance of the saloon. The vessel is divided into compartments: No. 1 was the forehold; before that was the peak—it was divided from the forehold by a water-tight iron bulkhead. The main hold was No. 2, and was divided in the centre by a wooden bulkhead. The aft part of the mainhold is called No. 3, and that is divided from the engine-room by an iron bulkhead and the engine-room is divided from the after hold, which is called No. 4, by an iron bulkhead. The holds were ventilated by the hatches. No. 3 was ventilated by opening the hatches on Monday. The trimmers went down to trim the coals; no lights were taken down, there was sufficient light from the opening. The other hatches were closed on the Sunday, battened down with canvas in the usual manner, and continued so until the time of the accident. No. 1 was battened down the last. We have printed rules on board the vessel, issued by Messrs. Wilson. Rules produced marked "B" are the rules. I have looked at them, but not carefully. They were in the mate's cabin for me to look at if I was so minded. I have seen two copies of the rules on board the ship. I have never heard the rules read over by the captain or chief officer; they may have been. The crew had access to the rules if they chose to ask to see them. I was aware of rule at p. 13 as to naked lights.

While I was reading in my berth as before mentioned, about 9.15 a.m., I heard an explosion in the vessel. There was a tremulous motion, accompanied by a dull rumbling sound. I went on deck forward. I saw that four of the iron hatches of the No. 1 hatchway had been blown away; the remaining or fifth hatch being then laid on the port side of the vessel. There was a derrick boom which was 10 feet above the deck; it had been broken in two pieces. The fore topsail and the stay foresail were both shivered, holes blown into them. I went to the captain to hear what were the orders. He ordered us to get some of the boats ready, and we got three boats ready, and while the men were getting the boats out he ordered other men to get a sail out. I mean by getting the boats out, swinging them over the side, and lowering them to within 3 or 4 feet of the water, so as to be ready. The sail was to be put over the port bow to see if it would stop the water coming in. I had previously looked into the hold, and saw a large hole had been made in the bulk-head between the peak and No. 1 hold. I saw Bennington, a seaman, on board on deck. He was very much injured, burnt black in face, head, and hands. All attempts failed to keep the vessel afloat. We got into the boats. There were two steamers in sight, the "Cairo" and the "Brighton." The "Cairo" was outward bound, and the "Brighton" homeward bound. The enginemen were first put on board the "Cairo." They were subsequently transferred and all hands to the "Brighton," and we were all taken to Liverpool, where we arrived on Friday the 16th day of May. A quarter of an hour after we left the "Zeno" she went down head foremost in deep water in the Bay of Biscay, in about 40 minutes after the accident. Independent of the accident which happened to three or four of the men all the crew were saved. We had on board the usual signal and cargo and hold lamps. The cargo lamps had glass round, and vent holes at the top. They were not what we call naked lights. The cargo lamps were used by the labourers in taking in and discharging cargo. In addition to these we had two or three lanterns, and there were several lamps that had no frame to them, naked lamps, spirit lamps. These lamps (spirit lamps) were used in the engine-room; in the bunkers for trimming, and one in each forecastle—firemen's and seamen. It is common to use that description of lamp in all steamers that I have gone in. These lamps are usually hung up in the forecastle at night. I have been in four steamers, and they have been used in all. When we were loading the vessel at Cardiff candles were used. The trimmers required candles to be used. The trimmers formed no part of the crew. The accident happened in the store room, which is immediately under the forecastle in the bow of the vessel. I have been on board vessels laden with coals several times before, and never knew an accident happen of that description. I have never been on board a vessel laden with Cardiff coals. It has not been usual to take off hatches in vessels I have been in before laden with coals. I have known the hatches remain on, I can say with certainty, for a month.

Cross-examined by Mr. HEARFIELD.

I have been at sea between five and six years, and have been in ships before the "Zeno," but never in a finer ship. She was well found in every respect. I think it was not possible to suggest any improvement in her. I have sailed with Captain Owen since I joined the "Zeno" in November last. The captain is exceedingly attentive and careful. The ship was clear of the Bristol Channel out at sea when the hatches were battened down. I have never seen the rules of the Penarth Harbour, Dock, and Railway. I find the rules now produced marked E contain a rule, No. 18, as follows:—"The hatches of every vessel laden with coal "must be left open during the whole of the time such "vessel stays in the dock, basin, or harbour, and must not "be closed until such vessel has passed through the sea "gates, or from the harbour on her way to the channel." I say, considering that rule, that the hatches are to be closed after leaving. As a seamen, I know it is necessary to close the hatches as soon as a vessel leaves port. As a rule it would not be safe to proceed to sea without doing

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so; it would depend upon the weather. As a rule it is rough in the Bay of Biscay. I should close the hatches going into the Bay of Biscay. I consider it to be the duty of the chief officer, mine, and the carpenter's, to see to the closing of the hatches, and the ventilation of the cargo. The vessel left Cardiff on the Sunday, and it continued foggy until the Monday afternoon. It requires constant supervision on the part of the master in a fog in the English Channel. The naked light was in the store room. I consider the rules specially made to provide against fire. In my opinion it would require a "Davy" lamp to provide against an explosion. Sailors could not be got to use a Davy lamp; they will hardly use lamps. We have fires in the forecastle. I don't see why they should not be as dangerous as lamps and candles. At the time the vessel blew up I had no reason to believe there was any escape of gas in the vessel. I was not aware that Cardiff coals had any special liability to emit gas. After the explosion happened the captain did everything possible to save the vessel. After the explosion I saw partly the nature of the injury done to the hull of the vessel. The hull was specially damaged in the forepart, near the stem in the port bow. I saw several rivet holes in the side of the ship.

Re-examined by Mr. SAXELLYE.

The forepeak is separate from the hold by being divided from it by a water-tight iron bulkhead.

(*By Mr. Darley.*) There was a sluice-valve in the forepeak. I don't know whether it was closed; as a rule it is open. I know there is something to let the water out. I know of no means by which the gas could get into the forepeak. I believe the bulkhead to be perfectly water-tight.

(*By Mr. Wrangham.*) I do not know of any orders having been given to take special precautions on account of this cargo of coals on this voyage.

(*By Captain White.*) I hold a second mate's certificate of competency since 13th August 1872. The crew of the ship consisted of a master, three mates, carpenter, boatswain, lamp trimmer, three engineers, seven firemen, steward, mess-room steward, donkey-man, cook, and eight seamen. When we took coals in at Cardiff he, the captain, was mostly on board superintending the loading of the ship. The coals were put on board by a spout. It took from the Wednesday afternoon to the Saturday morning to put the coals in. There were stoppages, of course. The coal that was in the forehold was, I believe, not put in at one time. I should think there would be from 150 to 200 tons of coal in the forehold. There was a space of 8 or 9 feet between the top of the coal and the deck in the forehold. You could walk along the top comfortably. Besides trying to get the sail over the bows, three or four of the hatches of the main hold were lifted, and we started to throw coals over the side of the ship to lighten her. When we found it was no good, the main hatches were battened down again. I never noticed any damage to the partition between the forehold No. 1 and No. 2. If that partition had been in good order I do not think it would have saved the ship. I know of no ventilation pipes down into the hold. I saved part of my clothes and sextant. The reason why I said you could not get a sailor to use a Davy lamp is because they are too careless. If there were two lamps, and one not a Davy lamp, they would take the first that came to hand.

(*By Mr. Darley.*) Even if their lives were dependent upon the use of a Davy lamp, and they were told so, it would be a question whether they would use it.

(*By Captain White.*) The hatches had been closed since Sunday forenoon to the time of the explosion.

(*By Mr. Darley.*) My captain was most certainly a sober captain, a very sober one. They opened and closed the sluice valves from the deck. The carpenter looks after them. As a rule I believe they open by a screw.

(*By Captain White.*) The main hold was full of coal, and in the after hold the lower part was full, and between decks there were bunker coals.

THOMAS BOOTH.

Taken on oath before
WALTER WRANGHAM.

WILLIAM VICKERY, of No. 45, Blackfriargate, Hull, Seaman (A.B.) I was boatswain on board the "Zeno." I have been to sea between 19 and 20 years. The "Zeno" was a screw steamer, brig rigged. She had 29 hands, all told. I joined her last November as able seaman. I was appointed boatswain late in December last. My duty was to forward the officers' orders in carrying on ship's duty in general. I had no night watch on the "Zeno." In the early part of May we were in Penarth Dock, Cardiff, taking in a cargo of coals. I believe they were steam coals. We took in, I believe, 2,000 tons, including bunker coals. We commenced loading on the Wednesday. We were bound for Port Said, I believe. The loading was completed late on Friday night or early on Saturday morning. I cannot say how the coals were put in. We had to shift the ship very often to let the spout come into different holds. I believe No. 2 hold was completely filled first, but I cannot say it was all filled at one teeming. I expect it was filled first, because it is most in the centre of the ship, and we can trim the other holds afterwards better. I think No. 3 hold was next filled, but I cannot say for certain. No. 2 hold was filled completely. No 3, to the best of my knowledge, was filled. No. 1 was partly full; in the after part of No. 1 there was not much space; the top of the coals slanted down, and at the hatchway I should think there was a space of 5 feet from the top of the coals to the combings. I should think close to the bulkhead there was a clear space of 12 feet, the entire depth of the hold being 16 feet. We hauled out of dock on Saturday at 5 p.m.; there was a dense fog. We drew up in the Penarth Roads. On Sunday morning we got out to sea. We sometimes went "dead slow." It was Monday noon before fog cleared. I know we stopped to take soundings once. I was present. After fog cleared off she was put on full speed. We were also under sail. The wind was easterly. The vessel was divided into compartments. I don't know that there was any ventilation to the cargo, except that leading to the bunker holes. There were iron ventilators formed to catch the wind, a kind of a cowl made to shift according to the wind. There were four altogether, for the purpose of ventilating the stoke-hole. The carpenter has charge of the sluice valves. I know of no other ventilation than that I have spoken of, excepting the hatches. After leaving the dock I believe the hatches of No. 2 were battened down. No. 1 was battened down at 6 on Sunday morning. No. 3 was battened down after leaving the dock. They were opened on Monday morning. It was no part of my duty to attend to these hatches. I have seen the book of rules provided by Messrs. Wilson. I have never read them. Without being a printed rule it is a general rule not to allow naked lights to be used in the hold.

(*By Mr. Darley*). On this particular occasion I knew of no verbal orders having been given to be cautious.

Examination continued.—All went well till Tuesday morning at 9, or little before. I was in the paint locker in the fore part of the ship, over the forepeak. On going there I heard Arthur Bennington, seaman, ask the lamp-trimmer, John Andean, for some waste. Andean is now on a voyage in the "Winestead" to Cronstadt. Andean answered it is in the forepeak. I afterwards saw Bennington with a lamp, a common spirit lamp, a naked lamp, in his hand going into the forepeak. That is such a lamp as is used generally in forecastles and engine-rooms for trimmers. Knowing the rule that a naked lamp should not be used, I did not remonstrate with Bennington for this reason, I knew he was not going into the cargo hold, and of course I thought there was no danger attached to it. I had not previously to this time smelled any escape of gas and had no notion that there was any gas about the vessel that was likely to explode. I saw Bennington at that time take up the trap-hatch; he got down himself and was standing on some gear that was on the first platform of the forepeak, only his head was above the man-hole then; he then took the lamp in his hand, and had to stoop. As soon as he brought the lamp over the hole I saw a flame and felt a shock. I was from 6 to 8 feet at that time from the man-hole. I was slightly burnt on the left side of the back of my head. I am now quite recovered. I never was taken to the hospital. Immediately after the explosion, when I was in the paint locker and lamp room, I felt myself partly buried; the fixtures in the forecastle were all blown in confusion. I tried to get on deck, but was a few minutes in doing so in consequence of the smoke and the things being thrown on me and the passage obstructed. I got on deck eventually. I thought that Bennington was still in the forepeak, and told Mr. Taylor, the chief officer. I saw Bennington shortly after on deck aft; he appeared to be much burnt. The master was on the bridge issuing orders. The chief mate was forward looking after things. We heard a noise, and chief mate said "Is that water rushing in." Orders were given, I believe from the captain, to take off the hatches from No. 2 hold; they were taken off; I assisted to take them off. I heard orders given, I expect from the captain, that we were to throw coals overboard, and some were thrown over. I went into the forehold with the chief mate and the carpenter. I found that the fore-bulkhead was blown into the forehold more from the port side; the greater part of it was blown down. Part of the plates were started from the port side; a midship stanchion supporting the foredeck was down. *I saw a*

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quantity of rivet holes. We attempted to fill the rivet holes up by putting in wooden plugs. We remained doing this until we were driven out by the water rising on us. I did not see any plates blown clean away. No. 1 hatch was covered by five iron hatches at the time of this explosion; they were battened down. The explosion blew the whole of them off the hatchway; I saw one of them on deck, but no more. The fore staysail and fore topsail were both set at that time, and both were torn; a derrick boom, five feet above the hatchway, was broken in two. The hatches had been covered with tarpaulin. I saw one of the tarpaulins lodged by the explosion on the fore topmast stay; that was from 30 to 40 feet from the deck. I saw the chief mate and some hands trying to lower a sail over the port bow. I did not assist. I imagine it was to try and stop the water rushing into the vessel. The captain was on deck attending to his duties all this time. There were no deck pumps going at that time; everything that I can judge of was taken to keep the vessel afloat when we found the ship, notwithstanding our exertions, was fast sinking. I heard an order passed to get to the boats. We all went to the boats; some to one boat some to another. After getting into the boats we were ultimately taken on board the "Brighton." The "Zeno" sunk 25 to 30 minutes after we left her; she sank in about an hour after the accident happened. We had general signal lamps, cargo lamps, glass lamps with vent holes at the top. Inloading at Cardiff, in trimming the ship, candles were used; the trimmers demanded them. The trimmers do not belong to the ship. No remonstrance was made to the trimmers using candles.

Taken upon oath before W. VICKERY.
WALTER WRANGHAM.

The Court here adjourned to the 12th June 1873.

12th June 1873.

WILLIAM VICKERY recalled.

Cross-examined by Mr. HEARFIELD.

I have been in several steam ships. I have no complaint to make against this vessel. I never was in a better found vessel. I have not the least complaint to make against the master. I have been before on board coal-laden vessels, with Welsh coals. In those cases it is the rule to keep the hatches open while in port. I have known ships go to sea with hatches off, and I have known cases where you could not proceed to sea with hatches off. The hatches were battened down the forehold on the Sunday morning, and continued so till the explosion. It frequently happens that vessels laden with Welsh coals must have their holds battened up a longer time owing to the weather. I am not aware that the weather has any particular effect upon Welsh coals in respect of their emitting gas. I am not aware that foggy weather makes any difference to them. This steamer had a half deck. The ventilators into the stoke hole passed though the half deck; they are large iron pipes, 3 feet in diameter, perhaps less. They might be 2 feet in diameter; they had bell mouths. I am not certain there was any means of ventilation from these pipes to the half deck. There is a slide in two of them in the between decks. There were also bunker holes besides these. In fine weather these holes are generally kept open. I believe some were open during the two days the vessel was at sea. I do not think the bulkhead could be made so tight as to prevent gas getting through; I think the working of the ship would make some outlet for the gas to escape through. I should think water would also drain through them; that is, a little hole might let through a great deal of gas and very little water. I went into the forehold after the accident. I observed the but straps; the rivets were out of them; the water was pouring through. When I got down below the water had got up to the top of the coals in the fore part. I went below about 10 minutes at most after the explosion. During that 10 minutes a large quantity of water had got into the vessel. I could not see the whole quantity of water coming into the vessel; I saw it pouring in at different places. From what I saw I should think she was damaged below principally. I saw some of the rivets clean out from the but straps. It would follow from that, that the plates must have been bulged out at the junctions. The forepeak and the No. 1 hold had iron decks formed of iron plates on angle iron formed in the usual way, therefore I should think that the decks would be of the same strength as the sides; at all events the deck would be very strong. I did not examine whether the aft bulkhead of No. 1 hold was damaged. Now, judging from what took place after the explosion, and considering the time we had to do it in, I think that everything was done that could be done to save the ship. I have the charge of the forepeak. I was last in the forepeak before the time of the explosion on the Monday forenoon. I had a light with me then. I did not observe then any particular smell of gas.

Re-examined by Mr. SAXELLYE.

The half deck had coals in it. The slides in the ventilators I have spoken of could be opened. I cannot say whether they were or were not open.

(*By Mr. Darley.*) The holes in the ventilators were closed with slides, about 2 feet broad and more than 2 feet in height.

(*By Captain White.*) I suppose I have been six or seven years in the coal trade. From leaving Cardiff to the morning of the 13th we had thick weather and a rolling but not a broken sea. The hatches were off No. 3 hold. I don't know of any reason why the hatches of No. 1 hold should not have been taken off from the Sunday morning at 6 o'clock to the time of the casualty. On the morning of the 13th at that time I should think the ship was going between eight and nine knots an hour. When we left Cardiff I should think that the freeboard of the ship was about 4 feet. The ship had not a great deal of sheer. I should call it a moderate sheer. I consider the cause of the explosion was a man going into the forepeak with a naked light. I cannot say that the rush of gas would be into the forepeak. The top-gallant forecastle deck was started. When the hatch was taken off the fore peak by Bennington I did not smell any gas. I should think that the reason the master ordered the hatches to be taken off the second hold was to let the gas escape out of that hold.

(*By Mr Darley.*) The master did not explain to me who he ordered the hatches of No. 2 hold to be taken off.

(*By Captain White.*) I did not at any time before the explosion during the voyage hear any orders given that the hatches were to be taken off. I should think that the reason they did not get the sail over the bows was because they could not get weights to sink it in so short a time. The rivet holes I saw open were in the but straps in the forehold. When the plugs were put in they filled the holes partially. I should think it was between 30 and 40 minutes from the time of the explosion before we left the ship.

(*By Mr. Wrangham.*) When we went to the boats, it was all hurry, but there was no confusion.

WILLIAM VICKERY.

The above deposition was taken upon oath before
WALTER WRANGHAM.

JAMES ALEXANDER KIDD. I live at No. 3, Fawcett's Terrace, Hessle Road, Hull, Marine Engineer. I was chief engineer on board the "Zeno" in the month of May last. I hold a first-class certificate for competency as marine engineer. The "Zeno" hailed from Hull. I joined the "Zeno" at London in July last. When we left Cardiff on Saturday afternoon, May 10th, we came to anchor, and banked fires. I know that all coals coming from that quarter are of a most gaseous character, but not to the extent there proved to be. We sailed on Sunday morning, and all went well until the Tuesday morning at 9. I had just left the breakfast table. I had got to my cabin, and felt a shock. My cabin is just over the engine, abaft. I listened for a moment, but hearing the regular beat of the engine, I came leisurely out, and saw some of the men running, who told me it was an explosion. I immediately went below to the second engineer in the engine-room to tell him the cause of the shock, and to tell him to stick to his post while I went and communicated with the captain. I went to the captain and spoke to him under the bridge, where he was issuing orders. The captain ordered all pumps to be put on. I mean the steam pumps. The captain had ordered at the moment of the catastrophe almost, by telegraph, that the engines should be eased. That was before I went on deck. When I returned from the captain, according to his orders I stopped the engines. I ordered the doors, smoke-box, and fire-doors to be opened, and blew off steam, and got all the men on deck. I was the last to leave the engine-room. I told the captain I would remain in the engine-room till he called me, and begged of him if he had to go not to leave me. There was no water coming into the engine-room before I left. We had sluice valves on board the ship. All the valves were closed. It is the rule to keep them closed. We never use them. I have another means of drawing the water off from the holds by means of pipes. The sluice valves were under the control of the carpenter. He would not open them without my orders. I am sure they are all water-tight. I have been seven voyages in that ship carrying wheat, and we never damaged a grain. I left the engine-room when it was determined to leave the ship. The captain, chief officer, and myself were the last to leave the ship. I had merely looked down into the hold. I saw the water coming in. The captain wished me to

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remain at the engines. I saw Bennington; he was much burnt. Three others were burnt. They were all well attended to. It is a general rule at sea no naked lights are to be used. I never saw the rules of Messrs. Wilson on board the "Zeno." Closed lamps and open lamps were used on board this ship. We had common spirit lamps. The use of a naked light on board a ship depends upon the kind of cargo we have. With some cargos, if a common seaman saw a naked light he would sing out himself. We left the ship 40 minutes after the accident. From the time of the occurrence to the ship going down was 50 minutes.

(*By Mr. Darley.*) We had hand pumps to every compartment, and all were shipped when they underwent survey by the Board of Trade. Two bilge pumps attached to the engine-room, communicating with every part of the room, worked by steam. We had a bilge injection we did not use. The engine-room was dry.

Re-examined by Mr. HEARFIELD.

I have no complaint to make against the ship or the master. I am sure he did everything to save the ship. From habit I have got somewhat accustomed to coals. I can pretty well tell their quality, but may still be deceived. I saw the coals put on board the "Zeno." I had no reason specially to believe that these coals were of an especially gaseous nature. I have before been on board a ship laden with coals at Penarth Dock, I think from the same drop. I have on such occasion laid in Penarth Roads when it has been blowing a gale of wind for more than three days with the hatches on. When we get to sea it is sometimes necessary to keep the hatches on for more than a week together. This ship was ventilated as vessels are usually ventilated, and better than a good many I have been in. When the ship first began to make water, if the sluice-valves had been open, I could have told by the manner in which my pumps threw the water out; the ship being down by the head the water ran down that way. Engine was 200-horse power registered. At the time the ship went down the engine was stopped. She was a strong and good ship.

(*By Mr. Wrangham.*) I have never known anything of the rules of Messrs. Wilson; there was not a copy in my cabin. The strictness as to lights depends upon what cargo we are carrying. With some cargoes common sense will tell a man not to use a naked light. The men themselves often call out, "No naked lights there." I am inclined to the opinion of the second mate that a Davy lamp would be of no use. If I had been captain of the ship I should have had the hatches down on the Sunday and Monday; the weather was such I should not have had the hatches off the forehold. I mean that as regards the cargo the ship was better ventilated than many ships I have been in. The hatch being off, No. 3 hold ventilated the whole of the after part of the ship. That was the only means of ventilating the hold where the cargo was; I mean by taking the hatch off. The forehold was not ventilated.

(*By Captain White.*) The ship drew on leaving Cardiff 15 ft. 16 in. forward and 18 ft. 8 in. aft. The ship had about 4 feet freeboard. If I had seen a man going into the forepeak with a naked light, as my business does not lay in that part of the ship, I hardly know what I should have done. If this accident had not happened and a man had been going down into the forepeak with a naked light I should not have thought that there was any danger, as so short a time had elapsed. The coal was dropped into the ship from a spout; the ship had to be shifted several times. I know they put in the coals very leisurely by driblets. The captain was at the ship when the coals were shipped; he was superintending generally. The Board of Trade survey was made of the "Zeno;" I cannot say when. It was in Hull, and since last July. At the time of the casualty we were averaging about eight knots. The coal I used for my fires was the same coal as the cargo. The coals were of good steaming quality. I did not observe it was gaseous; it was a hard, brittle Cardiff coal; it breaks all to pieces if hit by the hammer; it has the reputation of being of very gaseous quality. I have pipes connected with every part of the ship connected with my steam-pump. I did try to pump the water out of the forehold, but it did not draw freely on account of the head of the ship being down. The pumps were in excellent order; they did not pump as much water as I expected, owing, I expect, to the inclination of the ship. The rose of the pipe must have been covered. The pump was put on.

(*By Mr. Wrangham.*) The agent for the ship at Cardiff, Mr. Bovey, never gave me any caution relative to the coals, or stated that they were green coals. He never said a word to me about them.

J. A. KIDD.

The above deposition was taken upon oath before
WALTER WRANGHAM.

Police Court, 13th June 1873.

JAMES ALEXANDER KIDD recalled.

(*By Captain White.*) I had charge of the pump leading into the forehold from the engine-room. I had not seen the rose for a month or two; it would be two months prior to the accident. I am sure the pipe was clear, because I pump her out regularly every hatch. It is possible the pipe may have got damaged in the explosion. I should think it would be liable to be so. The rose was right down by the side of the kelson, right against the bulkhead. I was pumping from the forehold. I don't think the coals had choked it up. It would have taken two or three minutes to have lifted the sluice valve. The ship sank before the water could have run aft even if the sluice-valves had been lifted. The sluice-valves were about four inches square. It is impossible to save the ship by pumping.

J. A. KIDD.

Taken upon oath before
WALTER WRANGHAM.

GEORGE EDWARD COULTAS, of No. 4, Brigham Terrace, New Adelaide Street, Hull, ship's carpenter. I was carpenter on board the "Zeno." I joined her on the 9th day of October 1871, immediately after she was launched, and have been in her ever since. She was a first-class ship, and well found in every respect. We took in a cargo of coals at Cardiff in May last. No. 2 hold was filled up first, then No. 3 hold was partly filled, and then No. 4 hold was partly filled, then the forehold No. 1 was partly filled (she had no more put into No. 1). After that No. 3 was filled up as much as required, and then No. 4 was filled up, that completed her lading. We began on Wednesday and finished on Saturday morning. After we got under weigh and left the roads the hatches of No. 1 and No. 4 were off; that was on Sunday morning between 3 and 4 o'clock. No. 1 hatch was battened down between 7 and 8 on Sunday morning. No. 4 hatch was battened down just before dinner on Sunday morning. There was a nice breeze, and a bit of splash on. When all the hatches were battened down we had no ventilation in the holds. Nos. 2 and 3 hatches were battened down on the Saturday night after leaving the dock. I asked of the mate if there was anything more to go down, and he said "No." It was then my duty to batten them down, and I did so. No. 3 hatch remained battened down till 8 o'clock on Monday morning, the 12th of May. By the captain's direction I took two hatches off No. 3. It was done for the purpose of giving ventilation, and likewise of giving light to the trimmers. Those hatches remained off until the ship went down. On the Tuesday morning I received orders at 8 o'clock from the mate to take one or two hatches off all the other hatchways. After they had finished washing decks down the accident happened before I could carry out the order. I saw one of the trimmers go down one of the bunker holes on the poop deck on the Sunday night. He had a light with him. It was a common spirit lamp. I was never furnished with a copy of the rules furnished by Messrs. Wilson. I have seen them laid in the mate's berth. I have never read them or heard them read. The rules are not read on board the ship by the captain or chief officer. I am not aware of a rule that no naked lights are to be allowed in the hold for any purpose. I have been six or seven years to sea. I am not not aware of any rule on board ships as to the use of naked lights. I did not think it necessary to warn the trimmer when he went down the bunker hole. The bunker holes have lids, and are watertight. The men when they go below in the bunkers light their lamps between decks by striking a match. They generally leave their lamps below. They blow them out. On the Tuesday morning at 9 o'clock I was seated; I had finished my breakfast. I was seated in my berth in the forecastle. I saw Bennington come past. He was perfectly sober. He came on board at Cardiff in a boat after we got out of dock. Sometime after that he jumped overboard. When Andean told Bennington he could get some waste in the forepeak, Bennington asked Andean if he should require a lamp, and he told him he could either take a lamp or go without one, as he himself could get the waste without a lamp. Bennington took a lamp, a common spirit lamp. I was below, near the lamp locker then; when I got there he had got the trap hatch off, and was stood below. His head and shoulder were above, out of the hatchway. The hole is about 2 ft. by 18 in. The lamp was on the forecastle deck. He was drawing the lamp towards him when I got up to him, and when he got the lamp to the hole the explosion took place in the store room, which is part of the forepeak divided from it by a temporary platform. To get down into the forepeak we have bodily to lift up part of the flooring of the store room. The floor is all loose. I was about 3 feet from the edge of the man-hole at the time of the explosion. I was burnt on

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the right cheek and left arm. I was afterwards taken to the hospital at Liverpool, and remained there four days. At the time of the accident Bennington dropped down below. Shortly after I saw him on the deck; he appeared to be very much burnt. His clothes were partly singed. He could walk and was conscious, but not take care of himself. We had sluice valves on board the vessel. They were under my charge. They were all closed at the time. They were closed since we left Cardiff. As a rule they are always closed. After the accident I got out of the forecastle as soon as possible and went aft to the main deck. The captain gave orders to get the two quarter boats ready. I went aft and assisted at the port quarter boat. The captain came aft and ordered me to go forward and see what amount of damage was done. When I went forward the smoke the explosion had caused had cleared away. I went down into the forehold. I found that the forepeak bulkhead was blown down into the forehold. It was blown down about level with the box stringer. The box stringer is composed of several plates and bars of angle iron, about 18 inches broad, and it runs fore and aft the ship on both sides of the ship, and the one on each side of the ship is made fast to the side of the ship for the purpose of strengthening her. The forebeam was blown away from the port side, and the plates started from the stem. One of the large iron stanchions were blown down from the deck. I saw some rivet holes. Three of the straps from the buts of the plates were blown clean off. The rivets were blown out of some of the plates, and the plates were started on the stem. There had been five iron hatches on No. 1 hatchway; four of them had been entirely blown away. The remaining one was laid on the deck. I observed the topsail and forestaysail were split. The derrick boom was broken in two. The forecastle deck was started up two or three inches. One of the beams was bent up. I reported the injuries to the ship to the captain He ordered No. 2 to be unbattened, and the coals to be thrown out. Six or seven men went into the hold for that purpose. I went to the forehold and began to saw off wooden plugs, and the boatswain and the chief mate and another man or two who were in the forehold, began to fill up the rivet holes. We succeeded in filing up a good many of them. We remained there a quarter of an hour until the water drove us out. It was coming in pretty fast Coming up out of the forehold we saw some men bringing a sail to put over the bow. We got it over. It was not weighted. It had very little effect upon the vessel. I did not take the draft of the ship on leaving Penarth. I succeeded in saving part of my clothes. My berth was the first berth on the starboard side of the forecastle. Water was at that time in the forecastle up to the anchor lid. Shortly after the explosion I sounded the forehold and found 8 or 9 feet of water. I did not sound the main hold on account of not being able to get to the sounding pipe, as it was covered with coal. Before we went to the boats I and the chief mate made an attempt to put on the hatches of No. 2 hold, but did not succeed. We remained on board after the explosion took place 30 or 40 minutes, We were obliged to leave the vessel in consequence of her rapidly sinking. All the crew got in the boats, and independent of the injuries some of them had sustained, none of them were drowned. I saw the vessel go down. That was about an hour after the explosion. She went down head foremost in deep water. The crew was taken to Liverpool. We had the usual signal-lamps, cargo-lamps, and several spirit lamps. When they went into the hold, to the best of my knowledge, they used cargo lamps generally, either at sea or in port. In loading and unloading it is usual to use cargo lamps. Candles were used in loading with these coals. I do not know why. Labourers load the vessel. It was the case in this instance. No one remonstrated with them for using naked lights. I knew the coals taken on board were called steam coals. It was never intimated to me or in my presence that steam coals were dangerous coals. I have sailed in vessels with coals before, but not Welsh coals.

Cross-examined by Mr. HEARFIELD.

I have no fault to find either with the ship or captain.

GEORGE E. COULTAS.

The above deposition was taken upon oath before

WALTER WRANGHAM.

Police Court, 13th June 1873.

GEORGE E. COULTAS recalled.

(*By Mr. Wrangham.*) The sounding pipe only came up to the between decks; the pipe did not come up to the upper deck. There were coals in the between decks and over the top of the sounding pipe which was covered with a brass cap. That was the reason I could not sound. It was only the sounding of the mainhold that I could not get at. I never heard that steam coal was dangerous. I had no information from the authorities of Cardiff about keeping the hatches off, and I never heard of the dangerous nature of this cargo. I know as a fact that the hatches were open all the time until we got out of the sea gate.

(*By Captain White.*) It was not in every case usual to carry coals over this sounding pipe. On taking in a previous cargo I have mentioned to the mate, Mr. Taylor, that I cound not get at the sounding pipes on account of the cargo being over them, but I did not do so on this occasion. As a carpenter, I do not think it to be a proper thing for a ship to proceed to sea with the sounding pipe covered. I saw the hatch put on No. 1 hatchway on Sunday morning, between 7 and 8 o'clock. To my knowledge it was not lifted from that time to the time of the explosion. There was no ventilation into No. 1 hold at all during that time. I suppose the mate's reason for ordering me to take the hatches off on Tuesday morning was for ventilation. No. 1 hold was partly filled forward; the top of the coals would be 12 feet from the deck, aft about 5 or 6 feet. No. 2 hold was full, No. 3 was full, and No. 4 was full. Over No. 3 between deck we had about 20 tons. We had no other open spaces that the coal could be put in. We could have carried 200 tons of coal more if they had been put in the sides of the ship in the between decks. And there would be about 30 tons of coals over the between decks of No. 4 hold. These coals were not placed in the forehold on account of the trim of the ship. I know all the pumps of the ship. There were two pumps in the forehold, one leading to the deck and the other to the engine room, they both drew from the after bulkhead. There were two more pumps in the main hold, one leading to the deck and the other to the engine-room; and there were two more in the after hold, one leading likewise to the deck and one to the engine-room. These leading to the engine-room were steam pumps. We had not a portable pump in the ship. When we were driven out of the hold by the water there would be about 10 or 11 feet of water in the hold. If the pump in connexion with the engine-room was on it ought to have thrown water. If it was on I cannot account for its not throwing water. The hand pump was never put on to the forehold. I suppose there was not sufficient time to do so, every man being otherwise employed to the best advantage. It was my duty to rig the pump, and I was othewise engaged. I did not rig it because I was ordered to do something else. It would have taken me three or four minutes to have rigged it. I saw the rivets drawn out of the side. I suppose that was done by the force of the shock. If the rivets were good they would draw and not break off. The mate ordered me to put the hatches on the No. 2 hold. I suppose he thought there was a chance she might not not go down, and it was to prevent any water that come on the deck getting into the hold; if she did not sink we might have got a ton. I don't think if the sluice valves had been opened and the water in the forehold allowed to run off into the engine-room, and the pumps put on, that it would have done any good, she was making too much water. The first boat, the jolly boat, was out in three minutes. We got the long boat, the cutter, out; we did not get the life boat out. I was not present all the time when they got the cutter out. I remained there about three minutes. There were three or four men assisting me.

(*By Mr. Darley.*) It was my duty to examine the roses of the pumps leading to the engine-room, and the deck pumps. I did not examine them on this occasion previous to going to sea. They are protected from coal underneath the limber boards. I had examined the roses about 10 or 11 days before going on this voyage. I found them then in good condition. There was no accumulation there likely to choke them. I saw some of the rivets that come out. They were on the box stringer. They were drawn, and I infer they were good rivets. I consider it a proof of good work. The but straps were bent, not broken. None of them split across that I noticed.

(*By Mr. Wrangham.*) There would have only been three or four tons of coal to be shifted to enable me to sound down the sounding pipe of the main hold. I cannot tell how long it would have taken them to have shifted them. There was no other means of sounding. I could not have sounded down the pumps.

GEORGE E. COULTAS.

The above deposition was taken upon oath before

WALTER WRANGHAM.

ARTHUR WILLIAM BENNINGTON, of No. 34, Sutton Street, parish of Holy Trinity, in the borough of Kingston-upon-Hull, able seaman. I was an A.B. seaman on board the "Zeno." I joined between the 12th and 15th of last September. The vessel was at Cardiff in May last. I was

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paid off on the 8th May. I signed again on the 9th, and joined her again on the 10th, at Cardiff. I went off in a small boat to her in the evening. We got under weigh on Sunday morning between 3.30 and 4. I was not sober when I got on board. I jumped overboard. I suppose I wanted to get ashore. I got in again from the pilot boat. The vessel started in her voyage at 4 a.m.; it was foggy; she went slow. On Tuesday morning, the 13th of May last, I came on deck at 8 o'clock. I relieved the second mate's watch. After washing saloon deck I was ordered by the third mate to clean some brass work. I went into the forecastle to ask the lamp trimmer for his keys of the lamp-room to get some waste and oil to clean the brass with. There was no waste in the lamp-room. I told lamp trimmer. He said there is a bag full down in the forepeak. I went to the peak, took the hatch up, looked down, and saw it was all dark. I went into the lamp-room, and found a spirit lamp burning in the lamp-room. I took the lamp out of the lamp-room, and set it down on the deck whilst I got down the man-hole into the peak used as a storeroom. I was stood in the hole. The The carpenter and boatswain asked me what I was doing down there. I told them I was going to get some waste. It was a naked lamp. They never said a word to me at all about the lamp. I took the lamp, and as soon as ever I got it over the man-hole there was an explosion. When I came to my senses I found myself at the bottom of the peak, some 15 or 18 feet deep. The temporary deck on the storeroom was all blown away and laid about me. When I came to myself I found myself badly burnt on both arms and on the legs just above the boot tops, and all my hair but one tuft was burnt off. My face was burnt. My moustache and whiskers were burnt off. My clothes were a mass of ashes. My jacket fell to pieces. I had no trouble to pull it off. I must have remained insensible a few minutes. I got on my feet, and fell to the side of the ship. I managed to climb up to the upper part of the box stringer of the peak; then I felt my way aft to the starboard side of the bulkhead. I found the man-hole blocked up. I sung out for help, but could not make any one hear. I sat down on some of the gear, and by and by the smoke began to go away, and then I saw a light. I then went along the box stringer, and made for this light. I found the rivets blown out, and I got some fresh air by putting my mouth to them, which revived me. The water was also coming in fast. I went back again on the starboard side to see if I could get through the man-hole again. I could not, and I went into the wing of the bulkhead on the starboard side, and at last I found a plate of the bulkhead blown into the forehold on the port side. I got through and went on the box stringer as far as the hatchway, and then I got on the coals. The hatches were all off. There was plenty of light. I got out by the hatchway by myself. The coals were high enough for me to get hold of the combings, and I got out. My injuries were at once attended to. The steward dressed my wounds. I saw nothing more of the damage done to the ship. I had never tasted drink since Saturday. The lamps I used were those used generally in a forecastle. There were cargo lamps on board. We had signal lamps. Side lights. I don't think we had any lanterns. I have loaded twice at Penarth and twice at Cardiff with coals. I have had no orders given to me about the explosive character of coals by agent or anyone else. Last cargo of coals we never had a hatch off. We went to St. Nazaire. We were about five days on the voyage. I had no reason to suppose in going down to the hold with the lamp there would be any danger. I never smelt anything. The accident took place between 8.30 and 9 a.m. I did not see the "Zeno" go down. I was taken to Liverpool in the "Brighton," and then sent to the hospital in Liverpool on the 16th of May. I was discharged from the hospital a week last Wednesday. I remained an out-patient for a day or two, and then I came down to attend this inquiry.

Cross-examined by Mr. J. W. HEARFIELD.

In the last ship I went down into the forepeak with a light. I never went down into the hold of a ship carrying coals with a naked light; I never had occasion. The hatch would be off the man-hole about three minutes before I got a light. The man-hole was round; it would be about 18 inches in diameter. A man could easily get down it. After I took the hatch off I went to the lamp-room; the lamp I took was constantly used for going down there. The carpenter was down in the same place with this lamp on the Sunday afternoon. I suppose nobody would think there would be danger to go down into the forepeak with a naked light in that short time. No one but the carpenter and boatswain saw me go down. I never gave a thought about the gas. I did not know that gas coming from coals does not smell at all. All the rivets on both sides of the peak appeared blown out from the stem aft. I could see the water teeming in wholesale through the rivet holes.

(*By Mr. Wrangham.*) The forehatch was battened down between 6 and 8 a.m. on Sunday, and the carpenter went into the forepeak in the afternoon.

(*By Mr. Darley.*) I think the rivets were blown out for 6 or 7 feet, up and down on both sides. The but ends were all started; the buts were separated from the stem an inch or three-quarters of an inch. I did not notice whether it was more so on one side than on the other.

ARTHUR WILLIAM BENNINGTON.

Taken upon oath before

WALTER WRANGHAM.

JOHN BOVEY. I reside at Penarth, and am a shipping agent. I remember the "Zeno" loading at Cardiff; she completed her loading on the morning of the 10th of May last. She was in the Penarth Dock. I attended as the agent of the owners of the ship. The cargo was taken in their vessel on freight. I am Lloyd's agent at Cardiff, and I have issued a policy for my principals for 2,000*l.* on the cargo in this ship. During the time she was loading I was at the ship, on Friday the 9th of May. I was in conversation with the chief mate and engineer. To the chief engineer my conversation was as to the readiness of the ship. The conversation I had with chief mate was on the spout alongside the ship. It was as follows: I called his attention to the necessity for ventilating the cargo by keeping the hatches off. He was to keep them off from that time to as long as practicable. I stated to him my reason for wishing it to be done. I told him that the coal that was being put into the "Zeno" was fresh wrought (that is fresh from the pits), and pointing to some coal in waggons alongside, I remarked, "Now that coal you see there is very recently from the mine, and will generate gas." I stated that in order to support or strengthen the reason for keeping the hatches off. I know the rules of the Penarth Dock. I refer to Rule No. 18; I have read it. I know why that rule is made. It was made because the parties who made it knew that the coal that would be put in ships at Cardiff would generate gas, and that, unless well ventilated, there was the risk of explosion, which happened in the case of the "Zeno." This rule is framed in the protection of local interests so as to prevent an explosion in the dock. I have been about 16 years connected with coal, and know well the character of Welsh coals. I have known an explosion take place in a ship whilst loading with Welsh coals. The accumulation would only take place where there was no ventilation. I should think there would be great risk of an explosion in a ship that had received coals into her in the morning if a light was used in the evening, if there had been no ventilation. Strangely the gas generated by Welsh coals is inodorous. Fresh-wrought coal will give off more gas than coal that has been exposed if both were stowed away. The engineer did not hear this conversation. It is usual at Cardiff for the trimmers to trim the coals in a ship with candles; they would refuse to use a lantern. Candles are not dangerous, because there is good deck ventilation. They only use candles because they give a better light than lamps. The gas from Welsh coals is rather light than heavy. At the time of my conversation with the mate I explained to him the different modes of ventilating cargoes; that I had not any faith in any other mode than deck ventilation, that is by taking the hatches off and leaving them open. The coals from every colliery in Wales will generate gas, but not one more than another. It is notorious with us that explosions from the gas of the coal are more frequent in foggy weather owing to the depression. When I went first on board the "Zeno" I inquired for the captain. The mate said he was on board, and wished to call him for me to see him. I said it was unnecessary to do so. Considering the mate as being the executive, and in charge of the vessel, superintending the coal being put on board, and in shifting the ship, I could have then seen the captain if I had wished. I never saw the master to have any conversation with him on the subject of the coals being dangerous, or of the same tenor as that I had with the mate. The "Zeno" had exceptional despatch in loading; she was loaded in 50 hours with 1,500 tons, and that would tend very materially to cause an accumulation of gas.

Cross-examined by Mr. J. W. HEARFIELD.

One of the reasons for my going to the ship was to caution him about the coals. I should have an interest in seeing the ship loaded with despatch. Loading 1,500 tons in 50 hours would be a great despatch with us. I had given the freighters twice as much time to load in. The sailors would see the trimmers carrying naked lights, and it would very likely put them off their guard. I had no conversation on the subject with anyone but the mate.

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There is no fear of an explosion without a light. The gas does not affect the sense of smell, or the lungs in breathing. I have no recollection of telling the mate that it was usual for the shippers of coal to give notice that the coal was dangerous. There are no painted notices, or notices of any kind posted about on the dock sides giving notice of the dangerous qualities of the coals. I think it would be very advisable if it were so. I had conversation with the shippers as to their not sending the usual notice that masters of vessels are particularly requested to keep the hatches off to avoid any explosion from the gas emitted by the coals. One of the firm stated that to me. They were not in the habit of giving such notice. The firm was Cory Brothers & Co. What he meant to say was they never printed any notices.

Cross-examined by the mate, JOSEPH WHALLEY TAYLOR.

We had the conversation I spoke about 9.30 p.m. We were on the staith. I had about half-an-hour before that seen you on the deck of the vessel. I do not remember you asking me why I would not go down to see the captain. It is very possible. I should explain to you that I was desirous the ship should be loaded as soon as possible, as I wished to carry out the wishes of Messrs. Wilson. We were in conversation the first time on the deck about five minutes. I possibly did ask you if the ship would get off on the morning's tide, and you said, "Yes, as far as the loading was concerned, but the boilermaker had not done with the boilers." I then inquired for the chief engineer, and you directed me to his berth. I was in conversation with the engineer as you left me. I may have been with him 10 minutes, and then I went on shore, and up to the drop head. You came up at my request. After speaking to you, and cautioning you about the coals, which was the purpose for which I wished to to see you, we had a general conversation. It may be that you came up to me for other purposes than what I wanted you for. I always found you attentive to your duties.

(*By Mr. White.*) I do not consider in reality that there is any danger in loading a ship so quickly as the "Zeno" was loaded.

(*By Mr. Darley.*) Our coal is not liable to spontaneous combustion. The coals from Swansea are liable to spontaneous combustion. I had an interview with the captain every day. He used to come up to my office. I always found the captain attentive to his duties. I have the highest respect for him.

JOHN BOVEY.

Taken on oath before
WALTER WRANGHAM.

Police Court, Borough of Kingston-upon-Hull,
8th July 1873.

Before WALTER WRANGHAM Esq., Police Magistrate.
CAPTAIN WHITE, R.N.
WILLIAM DARLEY, Esq., Naval Architect.

Mr. Saxellye for Board of Trade.
Mr. John Hearfield for Captain Owen (Master).

The mate, JOSEPH WHALLEY TAYLOR, appeared in person.

(Master's certificate handed in again.)

ADOLPHE PIÈRRE VASSARD, of No. 25, Finsbury Place, City, member of the "Polytechnic Society of Paris" and also of the "Chemical Society of Paris," consulting chemist and professor of chemistry in London. I have for five years studied the qualities and descriptions of English coal. I have been in England four years. I now hand into the Court my opinion as to the explosive qualities of coals. I have been requested by the Board of Trade to examine into the quality of coals, and particularly the Welsh coals. I have read the evidence which has been taken on this inquiry which has been furnished to me by the solicitor of the Board of Trade. I there find the explosion took place in consequence of the emission of an explosive gas. I have come to the following conclusions (see exhibit marked "V." annexed). I mean by sulphate of alumina in its crude state, ordinary clay treated by sulphuric acid. The Cardiff coal—hard, brittle coal—contains light carburetted hydrogen. That was the coal on board the "Zeno." The Cardiff coal gives off at 61° Fah. $\frac{3}{5}$ of a cubic foot of carburetted hydrogen gas per ton in half an hour. Cardiff coal exposed to a temperature of 100° Fah. gives off per ton in 36 hours 4 cubic feet and 138 cubic inches of carburetted hydrogen gas after giving off 2 cubic feet of same gas at the ordinary temperature in 12 hours. This gas is inodorous, and at once ignites on the application of a light. A person going into a forepeak where this gas was would not smell it, and it would not affect his breathing—it is not poisonous. He could not, without a light, tell its presence. To prevent explosions of this sort I should adopt a system of ventilation by shafts. I would recommend that coal should be exposed for more than eight days before it is shipped. It would then be not quite so liable to generate so much gas. According to the liabilty of the coals to emit gas they ought to be exposed for several days. The coal ought to be examined before it is put on board to know what quantity of gas it gives off. This could be done by a properly arranged cylinder; the amount of gas in a given quantity of coal could be thus ascertained and the captan of the ship informed how long he could with safety keep the hatches shut. I have long studied the explosive character of coals. I have recommended ventilation as a means of preventing explosions. Coals are a little injured by being exposed to fog. The fog would moisten the coal and render it liable to heat. The fog has no effect upon the coal to generate gas. The reason why more explosions occur in coal mines during foggy weather is because the ventilation is not so good. The effect of fog on coal has a tendency to cause spontaneous combustion and that only after lengthened exposure, and that on small coal. I have examined the drawing produced by Mr. Darley showing how vessels may be ventilated in various ways, and I certainly approve of that mode of ventilation. If this mode of ventilation could be applied to all vessels it would prevent explosions and would be effectual in allowing the gases to escape. The ventilator shown in the drawing carrying air to the bottom of the vessel is of great importance inasmuch as the carburetted hydrogen being lighter than the air, the air admitted into the hold would force the gas upwards. If one of those ventilators had been introduced into the forepeak of the "Zeno" I do not think the accident would have taken place. The plan produced is complete for the purposes intended.

Cross-examined by Mr. HEARFIELD.

The emission of the gas in Cardiff coals is caused by the breaking up of the larger fragments, and therefore opening the little cells in which the gas is contained. Each cell contains gas. It is the friction or leakage which liberates the gas, and burning also liberates the gas; that gas can be smelled. The gas contained in the Cardiff coal is carburetted hydrogen, or by a simpler name, "marsh gas," and is the same as "fire damp" in mines. Coals newly taken from a pit will emit a very large quantity of gas. About eight days ought to elapse before Cardiff coals should be put on board ship after being taken from the mine. If shipped earlier I should call them green coals. A captain of a ship would not know what were green coals; he ought to have been informed of this, especially as to Cardiff coals. If these coals had been kept eight days they might have been shipped and the hatches kept down for 30 hours with safety. The captain ought to have known more than the mere fact that they were Welsh coals; he ought to have been told they were green Welsh coals. In my opinion it is not proper to ship Cardiff hard, brittle coal at any time, after any amount of exposure. It would not be safe to ship them at all. I think the effect on these coals was caused by the action of the ship. Any kind of coal is liable to break by the motion of the ship. If there was no motion of the ship there would still be an emission of gas. The ordinary motion of a vessel at sea will pulverise coal. If these coals had been in perfect condition when shipped, I should not have advised the captain to take off the hatches during a fog. In case the coals were shipped in good condition on the Saturday, and the hatches were closed on the vessel's sailing on the Sunday, and a fog came on and continued during Monday, and the hatches were opened on the Tuesday morning, I should say they were opened as soon as they ought to have been. I never heard of a dry fog. There is always fog in the atmosphere, but you cannot see it. As soon as you see it we call it fog. If the hatches were left off the fog would saturate the coal; it would affect the coal worse than rain. It would not be proper for the captain of a ship to keep open his hatches during rainy weather; during foggy weather to do so would be much more improper. In my opinion it all comes to this, that these coals were shipped in an improper condition—too green from the colliery. Independent of experiment or notice given, the captain or owner would have no means of knowing the dangerous nature of the coals. If the light had been encased no explosion would have taken place. If the lamp had been supplied with air from the bottom of the lamp an explosion would have taken place. Practically there would be no difference between an ordinary ship lamp

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(encased) and a naked light. It would require a Davy's lamp to prevent an explosion, just as much as in a coal mine, if proper ventilation was not given. Even if vessels were properly ventilated as shown by Mr. Darley, I should never advise coals to be shipped until they had been several days from the pit.

(*By Mr. Wrangham.*) If a ship is loading the breakage is very great, and if a man were to go into the bunker with a naked light, even if the hatches were off, an explosion might take place, as the gases would be then escaping very freely. A ship supplied with Cardiff hard, brittle coal should use only "Davy" lamps.

(*By Captain White.*) I have never heard of coal being washed before it has been shipped. If the coal is wet when shipped, it will give out gas just as soon as if it was dry. The effect of wet on the coals is to produce spontaneous combustion, but this very rarely happens when the coal is in large lumps. I consider the hard, brittle coal of Cardiff to be more dangerous than other coals, owing to its explosive character. The effect of fog on the coals would not render them more explosive. I should consider it more prudent to keep the hatches off than to close them down. The Cardiff coals are not liable to spontaneous combustion. I consider it would be much safer if the cargo was divided amidships fore and aft the ship by planks placed Venetian-wise, so as to admit of the gases passing out. The space should be 15 or 18 inches wide. I also consider that a draught might be made by letting the pipes from the hold be led to the galley fire. These gases are all light gases. There is only one explosive gas, carburetted hydrogen. It is half as light as air. If the ship was fitted with these ventilating planks, all the gases would rise to the surface. If each hatchway was fitted with a pipe one foot in diameter that would be sufficient to allow the gases to escape. This explosive gas of carburetted hydrogen will explode at a heat of 123° or 124° Fah. There are no means of telling when this gas is present, except by applying a light. The coal upon which I made the experiments I do not know how long it had been brought from the mine. It would be better not to ship Cardiff coal at all, but if shipped, I recommend proper ventilation on board.

(*By Mr. Darley.*) I think the loss of the "Zeno" was not from spontaneous combustion, but by the application of the flame to the gas. The humidity of the atmosphere would not have a tendency to soften the coal. If the coals were small and wet at the top it would make very little difference in the rising of the gas. I am of opinion that the gas that found its way into the forepeak was generated in the forehold, making the forepeak into a receptacle for it. The deck and bows being both air-tight and water-tight, and the bulkhead not being air-tight the tendency of the gas to be pressed into the forepeak from the body of the coals, there being no agent to drive it back again, would cause the air to gather in the forepeak. I think the captain acted with great discretion towards the cargo by keeping the hatches on during a dense fog. My opinion is that any kind of ventilation that carries off the gas must be good. We must endeavour to find the best mode. I think that the Board of Trade should make it imperative that a good system of ventilation should be enforced in ships carrying coal. I think the coal owners should be compelled to give written notice to the captains and officers of ships as to the peculiar properties of the coals they ship, and the quantity of gas they are likely to give off in a given time, and the length of time the coals have been wrought from the pit. I think iron perforated tubes laid amongst the coals would be injurious as the water might come in contact with the iron, and produce hydrogen by its electric affinity, which is highly explosive. If a cowl had been supplied to the forepeak, and the fog had come in, the fog being heavy would have descended to the bottom, and driven the gas out, provided there was an escape for it.

A. VASSARD.

Taken upon oath before
WALTER WRANGHAM.

Official Report of the Inquiry.

The "Zeno" was a screw steamer, built of iron, and was of the following dimensions, viz.: length, 272 feet; breadth, 32 feet; depth, 16 and 18 broken; gross tonnage, 1,490 tons; horse power, 200, with two surface-condensing combined inverted engines; draught of water forward, 15·7; ditto aft, 18·7; freeboard, 4 feet. She was the property of Messrs. Wilson, Sons, and Co., of Hull. Her estimated value was 33,000*l.* She was insured for 11,000*l.* She was built in 1871 by Messrs. Earle and Co.'s Shipbuilding Company, Hull, and classed 18 years Liverpool. She was brig-rigged, and manned with 29 hands all told. Was commanded by Captain Edward Owen, who holds a certificate of competency. She was divided into four compartments for hold, and the bulkheads, with one exception, were of iron and watertight, and fitted with suitable sluice valves, and arrangements for pumping from each compartment. The ship was well found in every respect. She commenced loading on Wednesday, the 7th of May, in the dock at Cardiff, the cargo taken in being 1,500 tons fresh wrought Cardiff hard brittle coal from the pits, all being loaded in 50 hours. The shippers were Messrs. Cory Brothers and Co. Her loading was completed about 1 o'clock on Saturday morning, the 10th May. She left the dock the same day (Saturday) at 5 p.m., weather foggy. The hatches were closed as follows: No. 2 on Saturday night, Nos. 1 and 4 on Sunday, and No. 3 on Monday. They were not battened down till out at sea. There were fires used in the forecastle, and lights as usual. On Sunday afternoon the carpenter went into the fore peak with a naked light (the same lamp subsequently used when the explosion took place). On Monday forenoon, the day before the accident, the boatswain went into the forepeak with a naked light. In consequence of the dense fog that prevailed the "Zeno" lay in the Penarth Roads until Sunday morning, the 11th May, between 3 and 4 o'clock, when she got underweigh, and proceeded slowly, the fog continuing until the afternoon of Monday, when it cleared away. On the same evening (Monday) the captain gave orders that the hatches should be removed for ventilation on the following morning, which was partly carried out. All went well until the following morning (Tuesday) about 9 o'clock, in lat. 46° 45′ N., and long. 8° 11′ W., when one of the seamen, Arthur Bennington, requiring some waste, was directed by John Andean, the lamp trimmer, to the fore peak for some. Bennington took a common spirit lamp (a naked light), and removed the wooden hatch leading to the fore peak. He placed the lamp on the deck, close to the hole, and got down, standing on some gear, in which position as he stood his head was above the deck. He had to stoop to get below the deck, and, taking the lamp in his hand, as soon as he got it below the deck, an explosion took place, bursting the platform below him and precipitating Bennington into the lower part of the bow, a distance of 14 or 15 feet. He was much burnt, and rendered for some short time insensible. The fore water-tight bulkhead which divided the forehold from the forepeak was blown into the forehold, the deck above disturbed three or four inches, and the pillar to beam carried away. The butts of the plates of the bottom were separated from the stem on each side for a distance of 6 or 7 feet below the water, being open about 1½ inch. Some of the butt straps were ripped from the port bow, and the plate started, and a great many rivets drawn out. The explosion found vent through the fore hatchway, blowing up five iron hatches in its passage, which in their flight broke the derrick boom into two pieces, and shivered the mast, also tearing the foretopsail and forestaysail. The casualty arose from gas being generated in the lower part of the coal in the forehold, which found its way through some small aperture in the fore bulkhead into the fore peak, where a natural receptacle was formed for it, the greater part of which must have accumulated in much less than 24 hours, and the explosion of which was due to the dangerous use of the naked light used by Bennington. Captain Owen was on the bridge at the time of the accident, and immediately ordered the removal of the remainder of the hatches. A sail was got over to endeavour to cover the aperture in the port bow, but failed for want of weights. Plugs were made and driven into the rivet holes, until the men were driven out by the water gaining on them. The captain, seeing danger, ordered three boats to be swung out at the davits to within four feet of the water. A signal of distress was hoisted, which was answered by the "Cairo" and "Brighton." Finding the openings on the sides of the stem and on the port bow were so large, it was thought advisable to keep the sluice valves closed, and the steam pumps being used without effect, steam was blown off. On all hopes of saving the vessel being abandoned, the whole took to the boats about 40 minutes from the time of the accident (the captain being the last to leave), and were picked up by the "Cairo," outward-bound, afterwards transferred to the "Brighton," the weather at the time being fine and clear. From the time of the accident to the "Zeno" going down head foremost in deep water in the Bay of Biscay was about 50 minutes. The Court, upon weighing the whole of the evidence produced, and aided by the scientific information from Mons. Vassard, have come to the following judgment: that no blame whatever attached itself to the owners, Messrs. Wilson, Sons, and

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Company. From the very high reputation of Messrs. Earle's Shipbuilding Company they have the utmost confidence in the substantial construction of the "Zeno" and of her general efficiency. They exonerate Edward Owen, the master, and return him his certificate, the usual notice on shipment of dangerous Cardiff coal not having been given to him. With regard to Joseph Whalley Taylor, the chief mate, they consider he neglected his duty in not informing the captain of the dangerous condition of the coal after having been informed thereof by the agent at Cardiff. His certificate is therefore suspended for three months from the 11th of June. The Court feel bound, however, to point out to the Board of Trade the very dangerous properties of the Cardiff steam hard brittle coal, such as shipped in the "Zeno," as shown by the scientific evidence of M. Vassard, with the view of stringent instructions being given to prevent vessels going to sea without some efficient ventilation. Various means were suggested, amongst which were the following: a comprehensive system of ventilation from the upper deck by pipes, cowls, &c., as described in drawing accompanying, observing that had the "Zeno" been fitted with a cowl and ventilating pipe to the forepeak, this accident would not have occurred. The use of iron masts, uptakes to funnels of steamers, bilts, &c. By dividing the coal fore and aft by planks placed Venetian way, with a space between them, against the pillars of the hold. Also the funnel of the galley fire being utilised by means of pipes leading to it from the various parts of the hold. That each hatchway be arranged so as to admit of cowls being fitted to allow of ventilation when the weather prevents the hatches being taken off. It may be remarked here from evidence that it is more important with Cardiff hard brittle coal to have ventilation than to keep out water.

WALTER WRANGHAM,
Stipendiary Magistrate.

Police Court, Hull, July 9, 1873.

We approve of this report,

E. A. WHITE,
Captain, R.N.

WM. DARLEY,
Naval Architect.

THE "BERWICK."

Greenwich Police Court, 26th September 1873.

INQUIRY into the circumstances attending the casualty on board the screw steamship "Berwick," on the 9th of May 1873, while on a voyage from Shields to London; made by direction of the Board of Trade by Daniel Maude, Esquire, stipendiary magistrate, assisted by Admiral Powell and Mr. Darley, acting as Assessors.

Minutes of Evidence.

CHARLES ALMOND sworn.

I was first mate on board the steamer "Berwick" in the month of May last. She was loaded with coal in the port of Shields on the 8th of that month. She took in 732 tons gas coal. We had carried that description of coal before, a great many times, to various ports on the Continent. She left Shields on the 8th of May, bound for London; on the following morning we passed the Dudgeon light at 4 o'clock, and at 5 a thick fog set in, and the engines were eased half speed in consequence. I was on deck at the time, and at 6 o'clock there was an explosion in the fore end of the ship. I was on the bridge. I saw a quantity of smoke, wreck, and dirt fly into the air, and a man I saw fall on the deck on his head; that man was John Morrison, one of the firemen. I did not leave the bridge, there being a thick fog on. I stopped the engines. The man was shot up into the air about 14 feet. I saw no flame with the explosion. The captain and one of the men went forward to Morrison. I had not noticed Morrison before the explosion; I conclude he was below in the forecastle. I saw some men, two, come up from the forecastle after the explosion, hurt. When we came to London an inquest was held on Morrison. I cannot account for the explosion; we never had one before on board. The ballast tank was empty at the time, the water having been taken out before shipping the cargo. There is a store room, about 9 feet wide, between that tank and the cargo; that room was empty also, with the exception of a few stores. There are two hatchways in the store room. There were two holes in the tank for ventilation, which came into the forecastle; one hole was to sound the tank with, and the other hole was to allow any water that might get on to the top of the tank to run into it. There is a pipe from the tank to the engine-room. I don't know how far the pipe runs. I don't know that it ran as far as No. 3 compartment. There was a cock on that pipe. I don't know whether that cock was open or shut at the time of the explosion; it was under the care of the engineer; he would be the person to look after it. I did not leave the bridge till 8 o'clock. When she arrived in London on the following day, I went into the forecastle and examined the damage, and found that the tank top had been lifted, and some of the beams of the tank were broken; that was on the port side. The pipe that I have been speaking of was amidships. There was a little damage done to the deck on the starboard side. That was all I saw. There was a wooden deck above the tank; that was injured also. That wooden deck was a lining over the iron deck. The two men that were injured were also firemen. They were in hospital, one a week, and the other a little longer.

(*By Mr. Crossman,* who appeared as solicitor for the master and owners.) I have been three years in this steamer on the 9th of last June, and always engaged in carrying a similar class of coal. We make from 45 to 50 voyages a year; and this was the first explosion. There is a fleet of steamers employed in the same trade. Morrison and one of the men that was injured were off duty at the time of the explosion; the third man had just gone down into the forecastle to call them out of their beds. The cargo was stowed the same as usual, and we had fine weather. The hatches had not been put on. The forecastle is a very large one. The top of the companion of the forecastle had not been put on, and the doors were not shut. There is an iron bulkhead between the store room and the forecastle, which runs down to the bottom of the ship, and that iron bulkhead cuts off the tank from the store room. The store room is 9 feet in width, and extends from the deck to the floor of the ship; then there is a wooden bulkhead which cuts off the storeroom from the forehold. The pipe from the tank that I have been speaking of runs under the ceiling of the forehold and under the store room.

(*By Admiral Powell.*) We have two tanks; one is in the middle of the ship, in that we put cargo, and that tank at the time of the explosion was full of cargo. I have no reason to believe that the empty tank was leaky. All the holds had the hatches off, in order to let the gases off. It was the duty of the second mate to see to the stowage of the cargo. We have Davy's safety lamps for the store room, but in the forecastle there is an ordinary lamp and a fire. There was no indication of an explosion in the store room. There was an iron lid to the empty water tank which was screwed on.

(*By Mr. Darley.*) There was only one man-hole in the top of the empty tank, and that was fastened on. It was a square man-hole, and the lid was of iron, secured by screw bolts, and india-rubber packing round the lid. There was a wooden top on the top of that again, so as to make the deck flush. There was no access to the tank by any other means. The cock for emptying the tank was close to the bottom of the ship; it was shut off or opened from the store room by a lever. I suppose that the explosion took place in that tank. I have no reason to believe that the bulkhead was not air-tight. The hatches were off at the time of the explosion. The forecastle is on the top of the tank. The sounding pipe of the tank was not shut. That pipe came out under the forecastle hatch.

(*By Mr. Maude.*) There was a hole in the top of the tank to allow water that might be shipped to run into the tank.

(*By Admiral Powell.*) We had no paraffin or combustible matter in the forecastle. I did not see myself the hole on the top of the iron tank. I was only only informed there was one.

(*By Mr. Darley.*) The second engineer generally took the soundings in the tank. The wooden bulkhead I don't believe was water-tight; that runs right down to the ceiling of the ship. It is a wooden ceiling. I don't know how that ceiling was fastened to the floor of the ship. There was nothing shifting but the limber boards; the limber boards were only on one side, the starboard side, close to the kelson. By lifting the limber board you could get under the ceiling. There are some ventilating pipes in the fore hold; they were not filled at the time of the explosion. We have Davy's lamps in general use if we want to go below.

C. ALMOND.

The within deposition of the said Charles Almond was taken upon oath before me at the police court aforesaid this 26th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

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JOHN BAXTER sworn.

I reside at the Tyne Dock, and am a coal trimmer. I was employed to trim a cargo of coals in the "Berwick" on the 8th of May last; they were gas coals, about 700 tons, all gas coal. We warn all strange vessels as to the danger of these coals. We are cautious about all gas coals—about using a light in the hold of a ship. We use a naked light in loading a ship. The second mate had charge of the ship; he had nothing to do with trimming the ship. I was trimming for the owners of the ship. The second mate said she was to be full.

(*By Mr. Crossman.*) We warn foreign ships. The North-eastern Company have had boards posted for the captains of ships not to cover up the hatches when partly filled till she has got in all her cargo. That caution has only reference to gas coal cargoes; that caution is not given to regular traders, because the coals in those ships do not remain sufficiently long, and because they know the nature of the coals. The caution is not given to the masters of the vessels.

(*By Admiral Powell.*) I should understand that the caution applies to the ship while at sea, or in docks.

(*By Mr. Darley.*) There is no great smell amongst the the coals. The smell affects you more about the head. If the hatches are blocked up, the danger would be explosion. I have not known of any such explosion while I have been employed.

JOHN BAXTER.

The within deposition of the said John Baxter was taken upon oath before me at the police court aforesaid this 26th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

GEORGE SAMUEL BAYLEY sworn.

I am a surveyor of shipping. I surveyed the "Berwick" steamer on the 15th of May last. I was requested to survey the ship by the coroner who was holding an inquest on the man who had been killed. When I went on board, the wreck of the woodwork of the forecastle had been removed, and a portion of the main-deck. I found that four beams of the main deck had been broken; and three frames, the angle iron frames, of the ship to which the beams had been attached also broken; the beams were on the starboard side. I think the angle irons were on the port side. The pall bit was broken, the iron deck over the water tank in the forepeak was forced down on the starboard side, and upwards on the port side; some of the rivets on the bulkhead were sheered off on the angle iron. One of the angle irons on the bulkhead was broken, and the corner of one of the bulkhead plates was torn. There was a stove in the forecastle for warming; it was not broken; the paint which remained on the pall bit and in the forecastle scuttle was not scorched or blistered. The only appearance of fire that I could see was a piece of newspaper that was blown in between the plate stringer and the deck planks on the port side close by the scuttle. The length of the forecastle was 29 feet; the store room at the afterpart of the forecastle was 9 feet long; the size of the forecastle scuttle was 2 feet 2 inches by 2 feet 5 inches. There was no communication between the store room and forecastle, except the small crevices in the seams of the deck. There was a pipe at the lower part of the bulkhead of the forecastle which communicated with the ballast tank, amidships; there were taps on that pipe, both open when I examined it. The pipe communicated with both tanks; both with the one amidships that was full of cargo, and the tank that is stated to have been empty. The explosion, I am of opinion, was in the forecastle, above the empty ballast tank. With the forecastle scuttle open, I should have hardly thought the gas could have accumulated sufficiently to cause an explosion. Had the gas accumulated in the empty tank, it could have escaped into the forecastle through two holes in the iron plate at the top of the tank. I cannot form an opinion of the cause of the explosion.

(*By Mr. Crossman.*) The pipe connecting the two tanks was below the flooring of the midship tank, which was a double floor. I am not satisfied that the explosion was that of gas.

(*By Mr. Maude.*) The lid of the empty tank was torn from its fastenings.

(*By Mr. Cottingham.*) Gas in a confined space would force itself through any aperture.

(*By Mr. Darley.*) There was a communication between the fore and after tanks by means of the pipe that I have mentioned. I was informed that coals had been stowed in the after tank. I think the pipe was about 3 inches in diameter in the clear, shewing a communication between the after ballast tank and the forecastle through the pipe and holes in the deck of the foremost tank—supposing the taps of the pipe to have been open. There was an iron deck to the midship ballast tank, with a hatch in the middle of it, open. If that hatch had been on, gas might have generated in the tank and forced itself through the pipe, provided the taps were open, into the forecastle. The depth of the after ballast tank was 7 or 8 feet. With the hatch off I could not say that gas would generate at the bottom of the tank and so force its way through the pipe with the pressure of the coals. The diameter of the sounding pipe for the empty tank was 1¼ inch. The lid of the empty tank had been risen 14 or 15 inches. The explosion had disturbed both decks.

(*By Admiral Powell.*) I am of opinion that the explosion was at the top of the tank, and not in the tank.

(*By Mr. Darley.*) The scuttle to the forecastle was rather on the port side, nearly amidships, close to the forecastle bulkhead, 2 feet 2 inches by 2 feet 5 inches. The length of the forecastle was 29 feet.

GEORGE S. BAYLEY.

The within deposition of the said George Samuel Bayley was taken upon oath before me at the police court aforesaid, this 26th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

WILLIAM FOX sworn.

I was chief engineer of the "Berwick," and was so on the 9th of May last. It was my duty to look to the pipe that leads from the fore tank to the after tank. I know it was all right on the voyage in question; the cock was open. It is the practice to keep the cock open when the ship is loaded. The cock is at the end of the pipe near the fore tank. I have not known gas to accumulate in the bilges of a coal ship; have never seen an accident from such a cause. There was a slight explosion of gas in this ship in 1867, but no damage was done; that was in the fore part of the ship, in a partition between the forecastle and the bulkhead that separates the cargo—the store-room as it is now. I was not on board at the time, although I was the engineer. It occurred in port in the Tyne. The cock would not be open at the time, I feel sure of that; as a general rule we open the cock on going to sea. I feel certain that the explosion was caused by gas. I think the weather has a good deal to do with it. At the time of the explosion the weather was very heavy. I was in my berth at the time. I saw the deck blown up; the lining of the forecastle was all torn, and the tank-top broken; there was a smell of burning. One man was killed and two injured.

(*By Mr. Crossman.*) There was a light and a fire in the forecastle at the time.

(*By Mr. Maude.*) There were marks of burning on the men.

(*By Mr. Darley.*) The pipe is not intended to communicate with the after ballast tank; it ends in the bilge underneath the tank. We have portable limber boards in the after tank; they are short, one is nearly over the end of the pipe. The limber boards are 5 or 6 feet long. There is a strum in the after part of the tank with a cast-iron cover to it. I do not think it possible for gas to have passed up through this strum. The hatches of the after ballast tank were off at the time of the explosion; all the hatches were off. There were coals stowed in the flat above the after ballast tank, pretty nearly up to the upper deck. From the top of the tank to the upper deck is about 6 feet.

WM. FOX.

The within deposition of the said William Fox was taken upon oath before me at the police court aforesaid, this 26th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

Greenwich Police Court, 27th September 1873.

JOHN HYDE sworn.

I am a seaman and was one of the crew on board the "Berwick" on the morning of the explosion in May last. I was aft on the quarter-deck when the explosion happened. I first heard the report and then I came forward and saw one man lying down dead, and some men were trying to get up out of the hatchway. I did not go into the forecastle then, not till ten hours afterwards. Previously to the explosion, about half an hour before, I lighted a piece of a paper by the fire in the forecastle; the lamp being out, I lighted the paper to make a drop of coffee. Morrison was lying on the port side along the timber heads, about 12 feet from the scuttle hatch. I did not notice any peculiar smell in the forecastle when I lighted the paper. Two other men were severely burnt.

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(*By Mr. Crossman.*) When I was below lighting my piece of paper, Morrison was in bed. I then threw the piece of paper into the ashpan; it was nearly out.

(*By Mr. Maude.*) There is a sounding pipe leading from the tank below, which extends 3 or 4 feet above the deck of the forecastle, about a foot from the cupboard and 2 feet from the ladder. Where I threw the piece of burnt paper was 8 feet from the sounding pipe; that was half an hour before the explosion. I did not see anybody smoking in the forecastle. I did not light the lamp, I lighted the piece of paper to look for my pot to make the coffee. Morrison who was killed had a great habit of smoking his pipe of a morning before he came on deck. My impression is that Morrison must have struck his match to light his pipe upon this sounding pipe.

(*By Captain Powell.*) One hatch was off of every hatch, it being such fine weather.

(*By Mr. Darley.*) There are limbers in the fore hold. I have seen them up and have assisted in getting them up; they simply ship and unship; they are 4 or 5 feet long. I did not notice a pipe under these limbers. I have not seen the limbers taken up in the after tank. There was some paints and oils kept in the storeroom and some turpentine in a bottle, a tin bottle. The naphtha was kept there in a bottle also. There are two places in the after tank, one on each side, to let the water out of the tank. In one place it was 2 feet long, perforated with holes. It looked like brass. I know it was not wood; it was about 1 foot long, and the holes were the size of a little finger. On the other side of the tank the holes were about the same size, but the form of the plate was different—one projects above the flat, and the other is in the flat. I never saw that plate up, and cannot say where it goes to. There was an iron bulkhead on the fore side of the after tank: the aft bulkhead was also of iron. The limbers aft are from 2 to 3 feet of the bottom of the ship. I have never been down in those limbers, only to put my arm down to get the dirt out. If the hatches were on and the tarpaulines there would be no means, that I see, of ventilating the vessel whatever. I have assisted to load her on many occasions.

JOHN HYDE.

The within deposition of the said John Hyde was taken upon oath before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

FREDERICK ROGERS sworn.

I was a fireman in May last on board the "Berwick," and was on board on the morning of the 8th. I was in the forecastle when the explosion occurred. I did not hear the explosion. I was sitting down in the middle of the forecastle. I was burnt suddenly about the neck and arms. I did not smell anything. Morrison was coming out of the forecastle at the time; he was on the forecastle ladder. I did not see him light anything. I did not see him smoking his pipe. The third man who was hurt was in his hammock, 10 or 12 feet from the scuttle on the port side. I know that Morrison often lighted his pipe; he was in the habit of lighting his pipe before he went on deck of a morning; he mostly struck a match. I know where the sounding pipe is in the forecastle; I never saw Morrison strike his match on that pipe. I have seen him strike a match close by that pipe on a match box, as he kept his matches in a locker close alongside this pipe. I have seen him light his pipe at that locker; he would throw his match on the forecastle floor. I did not see him light a match on the morning of the explosion. He might have lighted one without my seeing him on that morning. When I got on deck Morrison, I found, was dead on the deck. I did not go into forecastle any more.

(*By Mr. Crossman.*) I went into the forecastle to call Morrison. I did not smell anything, nor did I see any flame.

(*By Mr. Maude.*) A man going up the ladder would pass by the pipe, which would be on his right hand, and he might easily have rubbed his match upon that pipe while passing up.

(*By Admiral Powell.*) I did not see much smoke in the forecastle.

(*By Mr. Darley.*) I had only been a week in the ship, one voyage. I was never in any of the holds. I never cleaned out the limbers, either aft or forward.

FREDERICK ROGERS.

The within deposition of the said Frederick Rogers was taken upon oath before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

WILLIAM CLARKE sworn.

I was second mate of the "Berwick" in May last, and was present at her loading with gas coal. There is a warning posted up not to batten the hatches down while the ships are loading. I complied with that notice. The "Berwick" has five water-tight compartments, four holds for cargo; the first forward is a ballast tank, and is always used for that purpose; No. 2 is a store room; No. 3 is the fore hold for cargo; No. 3 is not used as a ballast tank; No. 4 is used as a ballast tank; there is a difference in the ceilings of Nos. 3 and 4. The ceiling of No. 4 is double all over. No. 4 is used for cargo as well as ballast. No. 5 is used for cargo only; the ceiling of No. 5 is the same as No. 3, a single lining, but since the explosion a double lining has been put on, making it the same as No. 4. That was done because the ceiling was bad and allowed the coal dust to get into the bilge. There is a pipe leading from the ballast tank under the forecastle. I do not know how far it leads aft; it leads into the bilge. When the bilges get water in they are pumped out by the engine. I was in the ship in 1867. There was a slight explosion then in the store room, but no injury was done worth speaking of. That occurred in the Tyne Dock. That occurred by a man taking a naked light into the store room. The gas must have got in through the wooden bulkhead. Ever since that time it has been strictly forbidden to go into the store room with a naked light, that is to say, if the ship is loaded. Our hatches were off at the time of the last explosion. I was in my bed at the time and felt the shock.

(*By Mr. Crossman.*) The ceiling of No. 5 was repaired in consequence of injury received in unloading the ship.

(*By Mr. Cottingham.*) No alteration has been made in the ventilation of the store room since 1867. The hatch of that compartment was off at the time of the last explosion.

(*By Mr. Darley.*) I have been seven years in the ship. Before the explosion the only way of ventilating the ship was by taking the hatches off. Since the accident two ventilating pipes have been placed in the fore hold, about 5 inches in diameter. There are four pipes been fitted to No. 4 compartment, the ballast tank, and two in No. 5 compartment; also two in the store room and two in the forecastle, which go down into the tank. There are also two ventilating pipes in the forecastle which do not go into the tank.

WILLIAM CLARKE.

The within deposition of the said William Clarke was taken upon oath before me, at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

WILLIAM PARKER sworn.

I am steamship surveyor to the Board of Trade. On the 2nd August last, by direction of the Board of Trade, I surveyed the S.S. "Berwick," which was lying in the Regent's Canal Basin; her cargo was out. I made a report of the survey which I now produce, and it is correct. (Report read.) I am of opinion that the bilge would hold a sufficient quantity of gas to fill the tank and more; a portion might be drawn into the engine-room; from what I saw my opinion is that the explosion took place in the tank, and would rush out through the scuttle of the forecastle. I traced the pipe into the bilge. If gas accumulated in any of the compartments it would flow through the entire bilge.

(*By Captain Powell.*) The sounding pipe when I saw it went up to the upper deck. I would not pass a passenger ship with the sounding pipe coming into the forecastle where the men lived, unless it came to the main deck.

(*By Mr. Crossman.*) In colliers it is the general rule for the sounding pipes to end in the forecastle. We have no jurisdiction over colliers in that respect.

WM. PARKER.

The within deposition of the said William Parker was taken upon oath before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

ADOLPH VASSARD sworn.

I reside at No. 25, Finsbury Place, London. I am a member of the Chemical Society of Paris, also of the Polytechnic Society, Paris. I have analysed a sample of coal sent to me by Mr. Johnasson, the owner of the "Berwick." I produce a portion of that sample. I have sent in a report of that analysis, and now produce it. (Read.) I have no doubt that the explosion took place

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at the mouth of the pipe in the forecastle under the ladder. The report of the explosion would be very low.

A. VASSARD.

The within deposition of the said Adolph Vassard was taken upon oath before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

REPORT of ADOLPH VASSARD (referred to in his evidence).

I have no doubt that the cause of the explosion that took place on the "Berwick" was due to light carburetted hydrogen gas, otherwise metham, fire damp or marsh gas. This gas is but too often disengaged in coal mines from freshly cut surface or from apertures or blowers where it exists in a state of compression, or from the cells of the coal thrown open by the breaking of the coal. It produces all the accidents resulting from explosions in collieries. It is the result of the decomposition of wood or brom coal into mineral coal and is constantly formed by and disengaged from coal that has not yet attained the highest degree of decomposition represented by anthracite or stone coal. Of course it is so formed and disengaged in more or less quantity according to the actual state of the coal, that is to say, according to a graduate scale beginning with cannel coal and ending with anthracite.

The specific gravity of that gas is 0·559 or little more than half that of air. It is colourless and inodorous, and can be respired to a great extent without danger. When it comes into contact with air and a naked light, it at once explodes and produces carbonic acid gas, with the same effect as gunpowder.

Its illuminating power is very low, and it burns with a pale yellow flame.

It is a mixture of that gas and of carbonic acid that is given off when the bottom of pools in which water plants grow is stirred up.

I have examined the coal furnished to me by the owner as being similar coal to that which was on board the "Berwick" when the explosion took place. It consists of about one-third of highly bituminous coal and two-thirds of fine cannel coal. It well deserves its name of gas coal.

Some pieces of the coal are very curious, and show to actual demonstration that it is actually in course of further decomposition. It must be here remembered that cannel coal is the intermediate state of coal between wood coal and bituminous coal. Its decomposition is actually going on with large emission of light carburetted hydrogen.

The bituminous part of the cargo on board the "Berwick" was brittle and easily broken, and it may have been broken by the attrition of the ship; opening some cells and giving off its share of gas; but the great source of carburetted hydrogen was the cannel coal.

In four days a weighed quantity of that coal, broken up, gave me a quantity of the said gas equal ¾ of a cubic foot per ton.

Upon analysis the mixed coal gave me—

Carbon - - - -	64·72
Hydrogen - - -	21·56
Oxygen and Nitrogen - -	11·92
Ash - - - -	1·80
	100·00

It gives 13·549 cubic feet of illuminating gas per ton, or nearly 462 lbs.

Its specific gravity is 1·272. The nature of the gas that to my belief produced the explosion having been explained, it can be understood that on a steamer loaded with a large quantity of such a kind of coal so liable to emit it, a rather large amount of carburetted hydrogen will be given off, and if no or inadequate escape is provided for it, it will find its way into any empty part through any leakage or pipe to be found.

Moreover, if, as I understand it to be the case, on board ship carrying coal all available room is used, if the bilge was not actually filled up with coal, at all events some was close by the side of it or immediately over it or part of it, and though the gas is lighter than air it may nevertheless have been forced sideward or downward into the bilge where there, finding the leaden pipe leading into the ballast tank, of course it took that way. Although that pipe is provided with a cock to prevent the escape of water when the ballast tank is filled, it may certainly have been left open, not being actually wanted for the purpose which it was fitted for, because the tank was empty.

Therefore, it can be assumed that that cock was left open; that the carburetted hydrogen gas went through the lead pipe into the ballast tank, and there finding its way through the air pipe it went through it. That pipe, the evidence shows, had its opening immediately under the ladder of the forecastle, therefore a current of gas, carburetted hydrogen, was continually existing under that ladder.

The first man who went down the forecastle may have lighted his newspaper when on the bottom, without thinking, however, that he was not doing the best for his safety. The deceased, very likely, lighted his match, piece of newspaper, or whatever it may have been, while actually going down the ladder, whereby his naked light came into contact or nearly so with the opening of the air pipe, therefore with gas (carburetted hydrogen), and necessarily an explosion took place which was communicated at once to the inner part of pipe and tank, and did all the damage.

In conclusion though, there are anthracite and chemically agglomerated coal dusts that are not liable to give off carburetted hydrogen, it is necessary on board ship carrying coal of any kind to provide for a thorough ventilation of the whole cargo, and to take every precaution against the escape of inflammable gases through pipes or into places where they ought not to be found.

(Signed) A. VASSARD.

Exhibited before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

REPORT of Mr. William Parker, Board of Trade Surveyor.

Board of Trade Surveyor's Office,
St. Katherine's Dock House, Tower Hill,
August 5th, 1873.

I HAVE inspected the ss. "Berwick," official No. 6131, and have the honour to report as follows:

The vessel is 183 feet long, divided into six compartments by five iron bulkheads. In the first and third of these compartments iron 'tween decks are laid, and the lower parts used for water ballast.

In the first compartment and directly under the lower forecastle the explosion took place, tearing away from frames the whole of the iron deck from bulkhead to stem on the port side, bending and breaking nearly all the beams, and breaking three of the main deck beams above.

I have carefully examined the bulkhead dividing th tank from the hold and cannot conceive how gas could escape through it; further, I had it filled with water and found it perfectly tight. But I beg to call your attention to the pipe for running the water out of this tank; it is a 2½-inch pipe leading from lower part of tank to bilge in No. 3 compartment, and can be opened or closed by means of a cock attached to the bulkhead. The tank is always empty when the vessel is loaded, and if this cock had been left open, all the gas that accumulated and found its way into the bilge would flow into the tank, and considering it would not be required to be closed until the vessel was discharged and tank ready for running up, I think it likely it was left open.

I have further to observe that the only air pipes in the ship for the escape of gas were the sounding pipes, 2 inches diameter, which as usual were covered over on deck. The one that led from forward tank being alone open to the forecastle, and in such a position that a man going up the forecastle ladder could easily drop a lighted match down.

Since the explosion each compartment has been fitted with two 4½-inch air pipes, and the sounding pipe in forward tank carried above main deck.

This morning I intended examining the inside of forward tank so that I could satisfy myself there had been no other air pipes, and that bulkhead had not been repaired since the explosion, but when I got to the dock found vessel had sailed yesterday.

(Signed) WILLIAM PARKER,
Surveyor.

Exhibited before me at the police court aforesaid, this 27th day of September 1873.

D. MAUDE,
Stipendiary Magistrate.

The Report.

The "Berwick" was an iron screw steam ship, built at Cartsdyke, in the county of Renfrew, in November 1855. She had two decks, three masts; was schooner rigged, of 365 tons register, and the joint property of Messrs. George Elliott and David Johnessohn, of Usworth Colliery, in the county of Durham, colliery owners.

The "Berwick" was one of a fleet of steam ships solely employed in conveying coal cargoes, and made on an

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average from 45 to 50 voyages a year from the port of Shields to London and elsewhere.

She left Shields for London on the 8th of May last under the command of Mr. Robert Brown, who holds a certificate of competency as only mate, dated the 4th of July 1868. She had a cargo of 732 tons of gas coal on board. On the following morning (the 9th) at 4 o'clock the Dudgeon light was passed; at 5 a.m. a thick fog set in and the engines were eased to half speed. At 6 a.m. an explosion took place in the forecastle, and one of the stokers, John Morrison, who was at the time coming up the forecastle ladder, was blown some 14 feet into the air and killed, and two other firemen who were in the forecastle were much injured.

From the evidence it appeared that the "Berwick" was 183 feet long, and divided into six compartments by five bulkheads. In the first and fourth of these compartments iron 'tween decks were laid and the lower parts were used for water ballast. The first compartment, which was immediately under the forcastle, was used for water ballast only, the second compartment was used as a store room, the third for cargo, the fourth was a ballast tank and used also for cargo, and the fifth for cargo only. On this voyage the forward tank was empty, as was usual when the ship was laden; from this tank a discharge pipe led to the bilge under the after cargo hold; the cock of this pipe was, when the tank was empty, always left open. There was also a sounding pipe to this tank which terminated in the forecastle about 3 feet from the deck, and by the side of the hatch; this was an open pipe. There was also a rivet hole left open in the deck-flat to allow water to pass from the deck into the tank. The Court thus traced a direct communication between the bilge through the tank into the forecastle, where the explosion took place. It appeared in evidence that the coal shipped emitted a gas, although inodorous and not detrimental to life, and was highly explosive when brought in contact with flame.

Although the evidence is not entirely conclusive on this point, the Court have every reason to believe that the man Morrison, either by a lighted pipe or match, ignited the gas that came up from the sounding pipe, thus blowing him up through the hatchway and causing a lesser injury to the other two men who were at the further side of the forecastle.

The Court, after a careful consideration, exonerated the master of all blame, and returned to him his certificate.

It appeared by the evidence than an explosion took place in the forward store room of the "Berwick" in 1867, and there is every reason to believe that it arose from the ignition of similar gases; no one was then injured, and the damage was trifling. The owners, however, very properly ordered the Davy lamp to be used in future in the holds and store room.

The Court would suggest that the following precautions should be taken in vessels carrying coal cargoes, viz.:—

That the discharge pipes from the water ballast tanks should not terminate in the compartments where explosive gas is likely to collect, and that all sounding pipes should be carried to the upper deck.

Also that arrangements should be made by pipes or other means to ventilate the lower part of the holds of vessels where gas is likely to accumulate.

The Court also attach the utmost importance to excluding fire damp or gas from the compartments where the crew live. This requires not only great care on the part of those who survey the ship, but the constant supervision of the master.

D. MAUDE,
Stipendiary Magistrate.

We concur in this report,
R. ASHMORE POWELL,
WM. DARLEY, } Assessors.

The following Memorandum on Gas Explosion, drawn up by Mr. Darley, Nautical Assessor in cases of the "Zeno" and "Berwick," at the request of the Board of Trade, has been forwarded to the Commission by that Department.

To T. H. FARRER, Esq., Secretary of the Board of Trade,
&c. &c.
12, Batsford Road, St. John's Road,
Deptford, S.E.,
SIR, 14th August 1875.

IN compliance with your request I have great pleasure in submitting the following memoranda and suggestions with reference to casualties from gas explosions on board colliers, observing that I shall be happy to aid you or the Royal Commission in any way you may desire.

I am, &c.
(Signed) W. DARLEY,
late Nautical Assessor.

TO PREVENT GAS EXPLOSIONS.

In a few words, to prevent accumulation of gas in confined spaces, and to command a free current of air to liberate it, has hitherto proved the most successful, and as a general rule explosions have taken place where this has not been attended to.

Great danger arises from the too hasty transfer of *green* coal just taken from the mine to the hold of the vessel; in this condition it is most gaseous, and hence the greater the danger; and although this applies to coal generally, it does particularly so to the Welch coal from Cardiff.

In order, therefore, to reduce the danger, it should be exposed to the atmosphere some seven or eight days previous to being shipped, but kept free from rain.

On being shipped, it will continue to emit gas, and more from heavy motions of the ship than when at rest; the tendency in the former case being to break the coal, and thus open the cells, and allow the escape of gas.

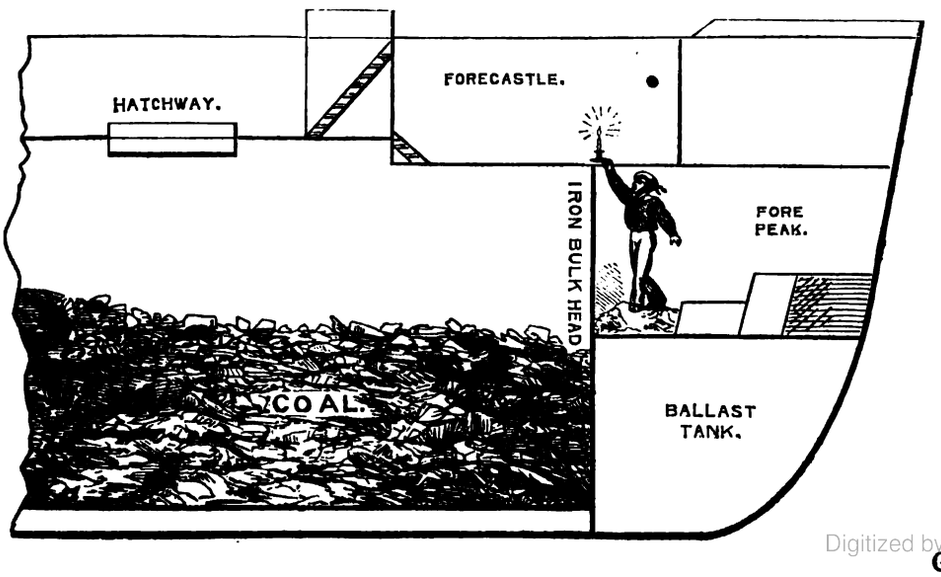
The specific gravity of gas being considerably less than atmospheric air, it naturally rises to the deck, and fills the space between the coals and deck; it also forces its way through any bulkheads to compartments adjacent to these in which coals are stowed, naturally in every case rising to the upper part of the vessel.

This was shown in the case of the "Zeno," where the forepeak, the fore side of the coal-hold, was made a receptacle for the gas, and in which the explosion took place, bursting the deck, the foremost bulkhead, and the bows of the vessel, by which in 50 minutes 33,000*l.* worth of property was destroyed, and 29 men placed in peril in the Bay of Biscay.

The accompanying sketch will give an idea of how it occurred.

The explosion in this case occurred through a man going to the forepeak with a naked light. He removed the hatch and went down and took the light in his hand. As soon as it was brought below the deck the explosion occurred, blowing him into the bows of the vessel.

"ZENO."



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I would remark that it appears to me that an action takes place from the point of explosion as a centre. In this case the man was blown down into the bows; in the case of the "Berwick" the man who was the cause of the explosion was blown into the air and killed. This appears to arise from the act of stooping to strike his match to light the pipe, when the explosion took place below him and blew him up.

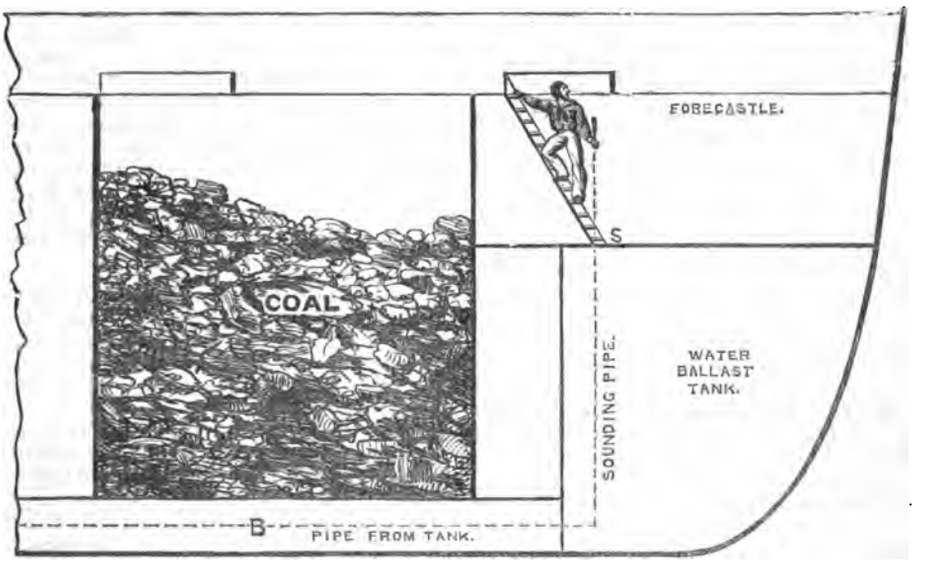
In each of these cases the gas was confined and no ventilation provided.

From the explanation given at the court at Hull on the "Zeno," she was built for a general cargo, and in this exceptional case was used for a cargo of Cardiff hard, brittle coal, shipped very green and under unfavourable circumstances, the weather being very foggy at the time.

The case of the "Berwick" was one in which the fore ballast tank was made the receptacle for the gas, fed by a pipe leading from the bilge in midships. At the upper part of the tank was fixed a sounding pipe, from which the gas as it escaped came into contact with the light and produced the explosion, as the man descended the ladder, of which the following sketch will give an idea, the light being produced from a match with which he was about to light his pipe.

There were two evils connected with this vessel, viz., the dangerous termination of the sounding pipe, S, between decks, instead of being led to the upper deck, and the pipe from the tank to the bridge, B, terminating in midships, instead of being led aft to the bilge of the engine-room, clear of the gases.

"Berwick."



On the sounding pipe, S, ending between decks it would lead the gas into the forecastle, and make that a receptacle.

The pipe, B, leading into midships brought it in contact with the gas generated from the coal, formed a passage for the gas to the water ballast tank, and hence the fatal consequences.

The fact of the vessel being thus attended with such results suggest that no coal vessel should be allowed to proceed to sea in such an unseaworthy condition as the best means to prevent casualties from a similar cause.

The drawing which I forwarded to the Board of Trade, by request of the court at Hull, contained a comprehensive system of ventilation, which is applied with such success in the Royal Navy that such a thing as gas explosion is unknown in the service, and not only applies for the purpose of dispersing gases to prevent casualties, but also for sanitary purposes, to carry off foul air.

I would remark that it is necessary at least two cowls be fitted to each compartment which it is desired to ventilate, the one as a downtake, the other as an uptake. One drives the cold air down, the other allows the heated air to ascend.

The gas and impure air will thus be incessantly driven out as it is generated.

Whilst these shown in the drawing are the most effective, others less expensive may be fitted to answer the same purpose; but the fatality of so many vessels from this cause renders it imperative, for the safety of life and property, that some such means should be resorted to, which, however expensive, is cheapest in the long run.

In wood vessels the openings between the timbers may be used to great advantage for the purpose of ventilation, and a strake of plank left open or hinged, so as to admit of being opened at pleasure, the fillings between the timbers and chocks being left out in some cases, will afford means also for ventilation.

Perforations or holes cut through the bulkheads at the upper part will allow of a free passage of air from one compartment to another.

The bitts, mast wedges, mast (iron) hatchways, funnel casing, ballard heads, and other fittings present facilities for ventilation, which, if used, provide excellent means for liberating the gases and preventing danger.

I have hitherto referred to the means of escape aloft; I would now direct attention to those which may be resorted to below, in order to prevent the heating of the coals, and to admit of a freedom of the escape of gas from the lower part of the coals.

The cargo may be divided in midships by two planks, one on each side of the pillars, the plank being fixed Venetian way, or perforated, so as to allow the gases to escape between them.

The same course may be taken athwartships, where it is desirable, by placing chocks or quartering between the plank, allowing the gases to escape.

Particular care should be taken to well ventilate those compartments adjacent to the coal-holds, which from the leakage of bulkheads, are likely to mislead into danger by the impression that because there is no coal there is no danger; the cases both of the "Zeno" and "Berwick" showing that the danger lay where there was no coal.

I cannot speak in too high terms, nor do I think too much importance can be attached to the use, of the Davy lamps on board colliers. There is the same gas and the same danger on board ships as in the mine, and therefore I think it would be both wise and humane to make it compulsory to use them.

They were used on board the "Berwick."

I would recommend that testing tubes be fitted leading from the deck to the lower part of the hold, so that periodically, by the aid of a thermometer, the heat of the coals may be ascertained, the lower parts of these being kept a short distance from the bottom will allow of much of the gas escaping; these may also be perforated at the sides, which will further liberate the gas.

There is an objection to use wood pipes, which are commonly fitted, from their tendency to forward spontaneous combustion, from the fact that the wood will take fire at a much less temperature than coal, and being the practice to put them in the main hatchway where the small coal is deposited, the pipes first get dry, then the point of ignition is reached.

They convey air to fan the smouldering wood into a flame, and afford means for the fire to spread.

In the absence of the wood pipe, the coal disposed to heat would take a longer time.

If pipes of iron, perforated, be placed in the coals, they should be fitted vertically, and not at the lower part of the cargo, to come into contact with water.

Earthenware pipes may be used to advantage, laid horizontally at the lower part, and in the centre of the cargo.

The galley funnel, from its heat, would act favourably upon a pipe led up at the back of it, the heat having a tendency to draw the gases up.

Advantage should be taken of fine weather to open the hatches, and wind-sails may be used.

Arrangement should be made to ventilate the limbers and under the flats of the holds, and that good arrangement be made for pumping in the event of a leak. It is a matter of importance, with the view of preventing spon-

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taneous combustion, that the cargo be shipped dry, that is, in dry weather, and that it be kept dry during the voyage.

There is much more risk with small than large coals, and it will be found that fires originate generally in the middle of the cargo under the main hatchway, where the greatest portion of the coal dust lies.

Coal having large quantities of iron and sulphur in their composition, being deposited in large quantities and not kept perfectly dry, are liable to spontaneous combustion, as a chemical action takes place, and ignites the coal, from which many vessels are lost.

(Signed) W. DARLEY.

"MIRANDA."

OFFICIAL INQUIRY held at the Town Hall, Cardiff, on the 13th September 1875, before R. O. Jones, Esq., Stipendiary Magistrate for the borough of Cardiff, assisted by Captain Castle and Captain Pryce as Nautical Assessors, respecting a casualty which happened on board the steamship "Miranda" off the coast of Cornwall on the 26th August 1875.

The Evidence.

PETER PETERSON.

I am chief mate of the "Miranda"; joined her at Waterford in the beginning of June. I went from thence to Cardiff and Malta. Arrived at Newport on Friday, 20th August last, in ballast. Began to load on Saturday, the 21st. It was my duty to see to the loading. When we began the holds were quite clean and all swept out; no damp or wet in them to my knowledge. Her forehold, mainhold, and afterhold were divided by iron bulkheads. Completed loading on Tuesday evening, between 5 and 6. The coal was all supplied by the same merchant, so far as I know. There were the same marks on the waggons. P. D. were the marks on the waggons. While loading we had wet weather; it was raining on Tuesday, and was raining on Tuesday night. The hatches were not on. The three hatches were loaded at different times; the afterhold was loaded first; part of the mainhold was loaded first, then the afterhold was finished, the forehold being loaded last. It was showery all day on Tuesday. We were not altogether engaged on the forehold on Tuesday, but finished loading between 5 and 6 on Tuesday evening, and went out of dock at noon on Wednesday. When we left the dock the hatches were put on, but one or two on each hatchway was left off. The main hatches and fore hatches went right across from coaming to coaming. The after-hatch was divided. The weather when we got out channel was a strong breeze going down channel from the west. At half-past six p.m. we battened down the hatches. I have been for the last five years in coal-carrying vessels, and for some time before. This cargo was properly stowed. There is no ventilation in the vessel in the fore and main hold. The main hold was full, close up to the deck, and the forehold there was a portion left out on account of trim, a space between deck and cargo of, perhaps, 2 feet; it was not trimmed flat. There was no communication between forehold and forepeak; they were divided by collision bulkheads, which I considered water-tight. It extended up to the forecastle floor. There was a hatch in the forecastle to get down into the forepeak—a small hatch, right forward. From 6 p.m. till we got to St. Ives Bay it looked like bad weather, and I thought it prudent to batten down the hatches. There was a strong wind and heavy sea. Spray came over. We removed one of the hatches of the mainhold on Thursday, at 9 o'clock a.m., to let out any gas. None of the crew had complained. The boatswain told me in the morning it was dangerous coal, but did not complain that the hatches were battened down. When we took off the mainhold we did not discover any smell of gas. The other hatches were kept on. On Thursday, 26th, my watch began at 8 a.m. up to 12. Nothing particular occurred. There was a ventilation to the afterhold of iron. I noticed during my watch that the carpenter was repairing the bell. When my watch ended I went on the bridge. There was no light to my knowledge in the forecastle at that time; did not order any down into the forepeak. There was a lot of stores there—rope, oakum, &c. There was nothing but oakum and pitch there for the carpenter. Soon after 12, when on the bridge speaking to the captain, there was an explosion. When I saw the flame and pieces flying I went behind the funnel. The vessel was going at that time about 5 knots, her full speed. After the smoke cleared I saw the whole ship was blown up forwards, and we at once went to get the boats ready; that did not take long. The vessel was on fire. The captain ordered the engines to be stopped at once, that was the first order he gave; then we got out boats and called for the carpenter to mend the pumps. There was no reply. I asked the chief engineer to set on the donkey engine to put out the fire, which was at once done. We were about half an hour extinguishing the fire. After the report the flame went up as high as the topsail yard, and everything went before it. First saw the carpenter on the poop. The foredeck was entirely blown off. I think nine beams were broken, some in two, and the deck blown up past the foremast, and the forecastle blown up. The damage did not extend quite to the mainhold. A small hatch belonging to the mainhold was off—a separate hatch. I saw some pieces of tarpaulin burning aloft. Some of the ratlines blown off the bulwark was blown off, the first plate down. The explosion had opened the ship. The explosion went up and lifted the stronger plate and bulged the ship out. The bulkhead between forehold and mainhold was damaged; was blown aft 4 or 5 inches, bent. The ship is now in the Hill dry dock. After the explosion, first saw the carpenter on the bridge; he was very much burnt. His hair and beard were burnt off; his clothes were in rags. I spoke to him. I said, "Lie yourself down on the poop." I said, "Have you had any light." He said, "No." I asked him where he had been first. He said he had been down forward; whether forecastle or forepeak I do not remember. I afterwards heard the chief engineer ask him where he put the light. He said, "On the seat, and when I took off the hatch it blew him down the forepeak." When we called over the crew Benjamin Davies was missing. The carpenter told us there was one man missing, he did not say whom. Davies was in my watch. There was one more of the crew hurt. I can form no opinion of the cause of this accident. I should think it would be the naked light. I suppose gas got into the forepeak. No notice or instruction about ventilation had been given to us before leaving Newport Dock. There are no regulations there that I know of. I have loaded a cargo of coals at Cardiff. Never observed any notice there about the explosive nature of the coal, or about ventilation. Of my own experience it is always necessary to take off hatches when the weather permits. The ventilator passes through the deck in front of the poop, and goes up about 8 feet. That was the only means of ventilation.

(*By Mr. Vachell.*) It was in my opinion a prudent thing to batten down hatches at 6.30. We shipped water during the night. The look-out was stationed that night on the bridge, not on the forecastle, because of the sea. There was rain, and it was blowing hard during the night. The next morning we took off one hatch. If we had taken one off the fore hatchway we would have shipped water down. At the time of explosion vessel was heading S.W. ½ W., and the wind was about W.S.W., a head wind, a little on the starboard bow. At the time of explosion we were off St. Ives Bay. It would have taken about one hour and a half to get round the land to the open. Having rounded the land the vessel would have headed about S. by E. We should have had a fair wind. Having a fair wind we should have taken our hatches off. The ventilator goes right down to the bilge. It goes to the pump and down. The ventilator is the pump itself. There was a Davy lamp on board the vessel. It was not prudent to take the hatchway to the forepeak off with a naked light close by. There was no light to my knowledge in the forecastle up to 12. When the men go to bed they would have a naked light. I had been on board this ship when she had taken a cargo of coal.

Re-examined by CAPTAIN CASTLE.

We had mooring bits, two forward and two aft, and two on poop, of iron. They were not fitted as ventilators. I have seen them so fitted in new ships; there was a sluice valve in the collision bulkhead, shut when I saw it; carpenter had charge of it. The hatch was left off the night we loaded to let any gas accumulated go off. It was against all orders to take naked lights below; no one goes down without orders. If I had sent anyone down I should have given him orders not to take a naked light. We had no lock to our forehatch. Anyone could, I suppose, go down at any time they pleased. I had not given them any orders then. The hatch in forecastle was flush with the deck. There was nothing to stop it going up if there was any pressure.

(*By Captain Pryce.*) Our engines were amidships, and our foremast was immediately before the bulkhead separating the fore from the main hold, the end was parted off under the hatchway, probably trimmed into the wings, but at the fore and after ends there was a space. The seat on

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which the carpenter stood the light was 20 inches above the deck and about 2 feet from the after coaming of the fore scuttle. The forecastle did not require a lamp in the day time; at night it hung nearly amidships in the sailors compartment of the forecastle; but a little abaft the forecastle. The deck over collision bulkhead was of wood. The carpenter kept his nails &c. aft.

EDWARD C. DOWNING.

I am a coal merchant and shipbroker at Cardiff. I have had upwards of 30 years' experience of the nature of steam coal, and give attention to the stowing of steam coal and its dangerous qualities. Coal of the Lower Duffryn, Middle Duffryn, Abergavawr, Fontaman, Cwm Rheol, Aberuman collieries are of the same quality. Coal recently taken from the colliery contains more gas than that longer exposed to the air, and coal recently taken would require more care in shipment and ventilation. Coal stowed in a vessel in a wet state would not be liable to give out more gas than coal in a dry state. In coal liable to spontaneous combustion the damp would produce it, but such a combustion has never taken place in coal of the kind. In a vessel loaded as this was it would be most dangerous to put to sea without proper precautions as to ventilation in the case of coal battened down.

[Mr. Downing's evidence was interrupted in order that the witness Dunn might be called to speak as to the collieries from which coal had been raised.—(Signed) D. REES, Justices' clerk.]

JOHN DUNN.

I am foreman at Newport of the Powell Duffryn Company. I know what coal was shipped in August last in the steamship "Miranda."

	Tons.
Fontaman - - -	136·6
Lower Duffryn - -	395
Abergwawn - -	121·13
Middle Duffryn - -	405·1
Aberaman - - -	228·4
Cwm Rheol - -	414

Altogether, 1,694 tons 4 cwts. 115 tons of screening were extracted. The nett quantity put on board was 1,579 tons 4 cwts. I saw part of the coal put on board. I believe the coal was very dry when put on board. From the invoices I have got, I can say that the coal had been about 24 hours out of the colliery, a little of it might have been longer.

(*By Mr. Vachell.*) I do not know what seam the coal came from like this, the air would in a very few hours be in a most dangerous state. It is usual to ventilate the holds of vessels loaded with coals of the description. The precautions are necessary in every hold. I should not think that gas would accumulate more readily where there is a space left in loading above the coal. The usual means for carrying off gas is to put the hatches open and pipes passing through the deck so as to create a current of air over the coals. I should think it most incautious in a master to batten down his hatches in a few hours after going to sea.

(*By Mr. Vachell.*) I know what kind of ventilators are put in vessels whose loading I superintend. I recommend the captains not to put wooden pipes. I might say the majority have iron ventilators of some kind. The ships I superintend generally take long voyages. A ship going to Bridgewater would equally require a ventilator with those going long voyages. I have known many explosions in dock in my experience. It is not usual to give notice to captains whether coal is recent or not from the collieries.

(*By Captain Castle.*) The tubes to take off the gas would be small 9-inch. I am not aware that mooring bollards are used as ventilators; iron masts are often used.

(*By Captain Pryce.*) Shown the plan. I should think it imprudent to have the hatches battened on before 12 hours, the coal being stowed as pointed out.

THOMAS DUNN.

I am A.B., living at Newport, and shipped in the 'Miranda" on the Monday before she left Newport. I shipped as fireman. She was loaded in the Alexandra Dock. There was one bit of a shower while loading. The forehold was the last loaded. The after-hatch was loaded first. I did not join till Wednesday about half-past 11. When she was in the basin the loading of the forehold had been completed, and was chock full up to the deck. All the hatches were battened down except one hatch on the forehold. Before we got outside the mouth of the river the forehold was battened down. That was done by order of the second mate. After that was done, order was given to wash decks. At that time all the hatches were fastened down. The carpenter secured them by order of the second mate. They were all battened down just as we got outside of the river. While I was on deck not one hatchway was opened, not even the little hatchway forward. I heard the boatswain grumbling about the hatches being battened down; we all grumbled. On the day after we left Newport my watch was from 8 to 12. During the watch I saw the carpenter about 10 o'clock; he was going to fix my bunker boards. At 12 o'clock I came up on deck, and just as I got to the forepart of the bridge away she went like the shot out of a gun. I was going forward. When the explosion took place we went to the boats, every man for himself; no one gave orders; all were cutting away the boats. I first saw the carpenter on the poop; the captain was putting oil over him and Jim James. After the smoke cleared, the captain gave order to put the hose on to dout the fire. After that I saw the captain putting oil on the men. Seven of the crew were English, the rest were Swedes. Benjamin Davies was killed by the explosion. Jim James was hurt, and the carpenter. We did not get our boats into the water.

(*By Mr. Vachell.*) The coal in the forehatch was shipped between 4 and 5 in the morning. We were there about 6, and then were told that the ship was not going out, so we went away. It was not raining at all. I was on deck when the ship went out of the basin. I have had no row with the chief engineer. After we got outside the Newport light there was no hatch off at all till it was it was blowed away. I did not complain to the captain about the hatch, it was not my place. I cheeked the boatswain about it.

(*By Mr. Waldron.*) I was sitting on the forehatch while we were going down the river. It was all down then. We got from the forecastle to the forepeak by a trap hatch; it was open two or three times. A man named John went down to the forepeak to look after his knife.

WILLIAM SMITH.

I was boatswain of the "Miranda." I signed articles on the 23rd August, Monday. I went on board on the Wednesday about half-past 10 in the morning. The vessel had completed loading, and was in the lock. She left Newport about half-past 11. We went down the river, it was blowing rather fresh. All the hatches were on except one hatch of the forehatch which was left off. That was fastened down about half-past 7 that evening. We were then below the Nash. When we got out of the river orders were given to clean the decks. I assisted. We began at the fore part of the vessel; we coiled the ropes away first. The middle hatch was entirely closed; the forehatch was open then, and I went down to the forehold to get some lines. That forehatch was not fastened down till we got below the Nash. The hatch was put on about 4; it was not battened down till half-past 7. From that time none of the hatches were opened. On the Thursday my watch was from 8 to 12 in the forenoon. I did on that day sound the bell at 12 o'clock by order of chief mate. The carpenter was working at it; the bell was lying on the middle hatch, and the carpenter said to himself, "I'll get a bit of wire to fasten the bell." He went to the forepart of the vessel. I went to my berth amidships, and was there about a minute when I heard a report, and went out and saw pieces of wood falling about. I was struck. I and all hands getting the boats, and went up and assisted. The forepart of the ship was blown up, and the hatch, and started the winch and blew the beams away, and the main deck as far as the foremast was started. There was a leak on the port side, and I shoved a sail in. I saw the carpenter come on the bridge holding his hands out and singing out. He went on the poop, and they put an awning over him. I had seen Davies that morning, the last time about two minutes before I went to my berth. He went to the foremast of the ship. After the explosion I picked up pieces of his cap on the poop. I heard the captain ask the carpenter if he had a light, and he said "No." Thomas James also was injured, and another, Gillmore, had his arm burnt and his hair singed. We landed those men at St. Ives. I have been in a great many ships laden with coal. The gas accumulated in the hold was cause of the explosion Never heard the sailors complain of the hatches being battened down; I did not complain to the mate. The carpenter told me he was going to batten all down for the night, and I told him not to be foolish. Thomas Dunn never spoke to me about it.

(*By Mr. Vachell.*) Going down the river the middle hatch was battened down. The main hold has two hatchways, a small one and a big one; both were battened down. I cannot say whether the after hatch was battened down. On the morning of the explosion the hatchway of

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the forehold was battened down. The night before the explosion it was blowing a fresh breeze at 12, but it calmed away before morning. We had shipped a great deal of water in the after-part of the ship during the night. When shipping water it is usual to batten down the hatches. I do not consider there was much sea on; there was pretty heavy roll, but the forehatch could have been opened very well.

(*By Captain Castle.*) The height of the covering of the forehatch was about a foot or a foot and a half, and the deck would have to be half full of water before it ran down the hatch. The night before the explosion the sea would open where they put out ashes. When I went below the day before I observed no smell of gas.

(*By Captain Pryce.*) I came on deck on Thursday morning at 8. She would have borne her fore hatches off at that time.

The "Miranda" adjourned Inquiry.
Town Hall, Cardiff, 14th September 1875.

JULIUS SCHALYE.

I am second mate of the "Miranda." I joined her two years ago in London. I have been six or seven voyages in her. She had coal on board every voyage. We arrived in Newport in August. I was on board while she was loaded. The holds were all swept and clean before she began taking in cargo. She was three or four days taking in cargo. During the time there were some showers. I was on board when the coals were put in forehold; they were not wet. There were some showers. Finished loading the day before we sailed (Tuesday). On the 25th we got out of the dock about 12. We were about a couple of hours going down the river. The after hatch was open when we left dock. It was battened before dark; the middle hatch was battened down about the same time. The fore hatch was closed about 7 o'clock. I was on the bridge at that time. The decks were cleaned up during the afternoon, about 2 o'clock. I did not notice the boatswain coiling up rope on the middle hatch. We had a strong breeze on getting into the channel and it continued during the night. During my watch, from 4 to 8, there was less wind, but the same sea. I came on deck at 12 at noon on the Thursday; as I came down the explosion took place, but I had time to notice that the small hatch of the main hold was open. I did not notice whether the after hatch was open. At 6 o'clock on the morning of Thursday I gave orders to one of the A.B., John Hansen, to go down the forepeak and take out some paint scrubbers. I told him, "Don't take any light with you." The forepeak is a dark place. I watched him from the bridge. I could see into the forecastle. He did not take a light with him. There was no light in the forecastle. I saw none during my watch. When the explosion took place I had just come down the foredeck to my berth. When the explosion took place I saw a lot of flame and smoke come out of the forehold. We went to get the lifeboats ready, and then put water down the forehold, because the coal was on fire. There was a lamp in the forecastle, hanging up. It was lit at 8 in the evening, when the sailors turned in. I do not know whether there was a Davy lamp on board. While going down channel I never heard any complaint from the crew about the hatches being battened down. I think the accident was the consequence of naked lights.

Cross-examined.

It was prudent to batten down the hatches on that night, because we shipped any amount of water over the bows. The crew could not keep a watch on the forecastle. On the morning of the explosion I went below at 8. It would not have been prudent at that time to take the hatch off, because there was a heavy head sea. I know the scuttle into the forepeak. It was similar to those I have seen in other vessels. I have never seen a padlock to any such hatchway. The mode of ventilation on this voyage was similar to that adopted on previous voyages. The carpenter had been two voyages in the vessel before this. I have been on board two or three steamers before. None of them had been ventilated otherwise than by the hatches. It would have been possible to have coiled rope on the main hatch if one or two of the hatches had been open. I am sure the main hatch was open while we were going down the river.

(*By Captain Castle.*) There was any amount of water over the bow after daylight. The forecastle was lighted during the day from the companion and bulls' eyes in the sides. I have never seen ships fitted with iron bits ventilators.

(*By Captain Pryce.*) The chain cables were bent to the anchor. The pipe to the locker was covered.

EDMUND SQUIRE ROBERTS.

I am agent at Cardiff for the Peninsular and Oriental Company, and have been here since 1870. We ship about 100,000 tons a year. Always endeavour to get the best description of coal, what is called the Cardiff steam coal. We ship a good deal of Powell's Duffryn steam coal. In shipping the best Cardiff steam coal only the usual precautions are necessary, that is, to keep a free current of air through the ship. There are other modes used, but I think them prejudicial. A great many vessels have large wooden ventilators coming through the deck. They are to prevent combustion. If coals are shipped dry we do not expect combustion at all. The coals from the pits named are likely to generate gas quickly. Gas would be generated in the hold of a vessel from such coal in a very few hours, particularly if shipped in wet weather. Coming fresh from the colliery, and put at once on board, it would be more liable to generate gas more quickly. Having on board such a cargo a master should then have his hatches open as long as weather would permit; he certainly should not batten them down for 24 or 36 hours after taking in the cargo, if it be possible.

(*By Mr. Vachell.*) There are times when the hatches must be battened down. It is very important to keep the coal dry. I have seen a great many steamers here loading with coal; none that I have seen have had ventilators; nothing but the hatches, and cowls at either end of the vessel. I am speaking from what I have seen and from what I have to do with. I have heard of explosions in the dock.

Re-examined.

It is absolutely necessary that a ship should be fitted with the cowls I speak of. If I did not see them in the vessel I have to do with, I should certainly speak about it.

(*By Captain Castle.*) It is necessary to have a free current of air in a ship built in compartments, I should think it necessary to have ventilation in each compartment.

(*By Captain Pryce.*) I should think it imprudent to fill each compartment with this kind of coal, and to cover up the hatches for 24 hours without some means of ventilation. And it would be madness to take a naked light after the hatches had been down for 17 or 18 hours near any orifice by which the gas might escape. I do not approve of loading the coal right up to the deck. The diameter of the pipe of the ventilation of the ship I have had to do with would be 14 inches, but smaller pipes would do. A gas pipe of 3 inches would carry away a great deal of gas. I have seen a chain pipe used as a ventilator. I have seen bits used as ventilators.

MOSES SHORES.

I am chief engineer of the "Miranda." I have been over three years in her, and during that time she has been engaged in carrying coal. On Wednesday, 25th August last, we were in Newport. I was very busy with the machinery below. I did not notice when they finished putting in the cargo. We passed Cardiff about 4. I came on deck while they were sweeping the deck. I did not notice the hatches; they were open while we were in dock. On Thursday my watch below commenced at 8. We were going about six knots full speed. We had head winds and sea which began the night before I went off watch at 12 at night. It was blowing and raining then. It got a little finer towards the morning. At 12 on Thursday, when the explosion took place, I was in the engine-room. I was on deck shortly before. I felt a terrific shock, and in a few seconds I had the order to stop her. I did stop her. I went on deck. I saw the captain after the explosion. I saw the carpenter and dressed his wounds. The captain was standing by. I said, "Carpenter, where did you place the light." He said, "I placed it on the seat locker till I lifted the hatch, and the moment I lifted the hatch, the explosion took place and blew me up;" that was all he said. He said to me, I afterwards found the bottom and lid of the lamp. It was the lamp used in the forecastle. I found it under the forecastle amongst the wreck; it was a common oil lamp.

(*By Mr. Vachell.*) There is a safety lamp on board. It was the carpenter's third voyage. I do not know whether he was warned about carrying a naked light. But he asked me on another voyage why he had to take the hatches off, and I explained to him about the gas, and he seemed quite satisfied.

(*By Mr. Castle.*) When I went forward I found the ship damaged; the beams, nine of them, were broke away, the forecastle blown up, the berth all blown to pieces, the forecastle bulkheads blown out, the main deck blown up right away to the foremast, and the sheer plate bulged out.

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The bulkheads blown in so far as the mainhold, the mainsail split from the rigging right on the forecastle; the front of the deck and the poop is broke; the deck ends on the poop are broken; the stringer plates were started. I missed Davies about half an hour after the explosion. The second mate was, I believe, sent down the forepeak to look for him. I do not know whether a boat was lowered, or whether anyone was sent aloft to look out for the body.

JOHN HANSEN.

I am A.B., lately of the "Marinda." On Wednesday, 25th of August, she completed loading. I was then on board. We left dock about 12; the hatches were all open. They were fastened down at 8 o'clock that night. There was a head wind and strong breeze, and we shipped a deal of water that night. On the Thursday morning I relieved the wheel at 12 o'clock. At 6 o'clock that morning I went, by order of the second mate down the forepeak, for paint scrubbers. He said "You don't want a light." I said I did not want a light because I had put the scrubbers there myself. I did not notice any smell of gas. When I came up I put down the hatch. There was no light when I put it down. I put out the light myself at 4 o'clock; it was an oil lamp, and kept just by the forecastle door. It was a tin plant with a spout. At 12 I went to the wheel, and had been there from 5 to 10 minutes before the explosion took place. I saw smoke and flame and pieces of wood blown about in all directions. Davies was in or near the forecastle. I found a piece of his cap on the deck. When I took the wheel I saw the carpenter working at the bell on the middle hatch.

(*By Mr. Vachell.*) A dinner time it was fine, but a heavy swell from the N.W. At 8 o'clock, I could not say whether it would have been prudent to open the hatches. At 8 o'clock there was a deal of spray to windward. There was a safety lamp on board kept in the store room. I never used it, but I have seen it used. I do not know of an order that it should be used by anyone that went below.

(*By Captain Castle.*) The wheel was right aft on the poop after the explosion. I ran to the bridge to the boats. I expected to go down directly. I saw nothing floating on the water.

THOMAS FOSTER BROWN.

I am a mining and civil engineer at Cardiff. I am acquainted with the coal raised by the Powell Duffryn Coal Company. Freshly worked coal from their colleries put into the hold of a vessel would, if barometrical pressure were lowered, have a tendency to give off carburetted hydrogen gas. It would only be a reasonable precaution to ventilate the hold of a vessel in which such coal is stowed. The hold of a vessel in which a vacuum was left would be more liable to combustion than where the coal is filled up to the deck.

EVIDENCE given on behalf of the OWNERS and MASTER.

JAMES STYLES.

I was for a long time a master mariner and am now a ship agent. I have commanded three steamers carrying coal cargoes, and since I have been agent at Cardiff. I have seen many more. The holds are usually ventilated by the hatchways being left off. In some cases assisted by small ventilators. I do not know of a number of vessels coming to Cardiff that have no ventilators. I have commanded one that had none. There are times in this channel when it is necessary to close the hatches shortly after leaving port.

(*By Mr. Waldron.*) I should think it negligent if I did not see to the proper ventilation of my cargo. It would be partly my duty as master.

(*By Captain Castle.*) The two vessels I commanded had for ventilators upright tubes in iron about 6 inches bore. Plain tubes, without cowls, and about 4 feet from the deck. I recollect, however, having some with cowls and some without. We had one only in each compartment. It was put there to liberate something rather than to create a current. But I agree that there ought to be one at each end. If there had been one at each end we should have kept the cowls on. I imagine the tubes would be better larger than 3 inches. The ship that had no ventilators I had no trouble with, but I felt uneasy sometimes.

(*By Mr. Jones.*) If I had left port, say, at 12 o'clock today, and the hatches remained closed from 6 or 7 this evening until 12 the next day, I should have felt uneasy; but I should have gone on as the captain in this case seems to have done.

HENRY CLOAKE.

I am agent for Messrs. Spire, steamship owners, and was formerly a master mariner, and I have had considerable experience as to vessels coming to Cardiff. I have known many ships coming here for coals which have not been fitted with ventilators. There is a steamer now in dock recently built which is not fitted with ventilators. I have never put a steamer about when she was going against a hard wind because of gas, or heard of its having been done.

(*By Mr. Waldron.*) It is decidedly necessary to have some means of ventilation over the cargo, and I should think wise to take such precautions. I should think I was, to some extent, responsible for the safety of my crew. If a ship is going head to wind gas would get to the fore part of the ship.

(*By the Court.*) If I had had coal battened down for 17 hours I should have endeavoured to prevent lights being used.

Report of the Court.

The "Miranda" was an iron screw steamer belonging to Hull, official number 60,140. She was built at Stockton-on-Tees in 1868, her registered tonnage 865·73 tons, and she was owned by E. Leetham and others, at Hull.

She left Newport about noon on the 25th August, with a full cargo of 1,579 tons of smokeless steam coals, bound to Kiel, and had a crew of 23 hands, all told, including the master, Mr. Wilhelm S. A. Van Deurs, who holds a certificate of competency as master, No. 18,491.

After clearing the Newport River she met with strong south-westerly winds and a considerable sea, which caused her to ship some water, but not sufficient to necessitate the hatches being put on.

All proceeded well until about 6.30 p.m., when, as the wind was increasing and night coming on, the whole of the hatches were put on and battened down that time, until after daylight the following morning, the wind continued fresh, with a high sea, and the vessel shipped such large quantities of water that the look-out man on the forecastle had to be removed to the bridge.

After 6 a.m. the weather moderated, but the sea still continued so high that it prevented the hatches being taken off, without the risk of wetting the cargo. Nothing further of importance occurred until shortly after 12 p.m. The forenoon watch had just been relieved, and the first officer and the master were on the bridge, when about 12.15 a terrible explosion took place in the fore-part of the vessel, which was instantly enveloped in smoke and flame. The engines were at once stopped and boats got ready for lowering; meanwhile it was noticed that the whole of the fore-part of the vessel, from the foremost forward, had been blown up by the explosion. As some fire was seen, the donkey engine with hose was at once set to work, and in about twenty minutes the fire was extinguished.

The extent of damage is described as follows:

Nine beams broken.
Forecastle deck and all the butts blown to pieces.
Main-deck blown up as far aft as the foremast.
Iron bulkhead to main-hold bent aft some four or five inches.
Stringer plates on both sides lifted.
Main-rail split, and sheer-strake, and bulwarks much disturbed.

The well was sounded, but the vessel made no water.

On mustering the crew it was found that Benjamin Davies, one of the crew, was missing, and is supposed to have been blown overboard, as portions of his clothing were found in the rigging.

The carpenter was most seriously burnt, and Thomas James, seaman, was also hurt. These two men were landed at St. Ives to receive medical help, about two hours after the accident, and were left in the infirmary there.

The "Miranda" then bore up for Cardiff.

The Court, on the evidence given before them, attached no blame whatever to the master, and they therefore returned him his certificate.

They find that this casualty is clearly to be attributed to an explosion of gas, caused by the use of a naked light near the scuttle of the forepeak by the carpenter, previous to and when he opened the scuttle, the gas having found its way from the hold through the collision bulkhead.

The gas had accumulated in the fore-hold from the time the hatches were battened down on the evening of the 25th until the explosion took place, and had no means of exit.

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It was stated in evidence that the whole of the cargo consisted of freshly wrought coal, none, with perhaps the exception of a few waggons, having been above ground more than twenty-four hours. In this state it was more dangerous than it would have been if exposed longer to the atmosphere.

After the loading was completed on the evening of the 24th August, the hatches were left off all that night until 6.30 p.m. on Wednesday evening, when they were battened down. From that time till the explosion, a period of 17 hours, the gas had been accumulating in the holds, which had no ventilation whatever.

After hearing competent and experienced mining engineers and other experts on the subject, the Court feel it their duty to offer some suggestions for future guidance with regard to these dangerous cargoes, and therefore respectfully ask the attention of the Board of Trade to the following points :

1. That all vessels about to carry cargoes of gaseous coal should be fitted with ventilating pipes or shafts at each end of either compartment or hold, that is, that there should be two ventilators in each hold or compartment, so fitted as to be constantly kept open.
2. That it is advisable in carrying this description of coal to have a small space between the deck and cargo, so as to insure a free circulation of air between the ventilators.
3. That the master should be instructed to have the hatches off whenever practicable during the voyage.
4. That naked lights be strictly prohibited.

Dated this 15th day of September 1875.

(Signed) R. O. Jones,
Stipendiary Magistrate.

We concur in the above Report,

(Signed) John S. Castle, Chas. E. Pryce, } Nautical Assessors.

In addition to these, the following Cases of Explosion of Gas in Coal-laden Vessels, in which no Statutory Inquiry was held by the Board of Trade, have also been reported by that Department to the Commissioners :—

"THOMAS PARKER," of Sunderland, an iron steamship of 739 tons register, four years old, and classed A1 Lloyds.

Was lying in South Dock, Sunderland, and bound for Cronstadt with 1,350 tons of gas coals; the hatches were left off, and also a hatch in store room, for ventilation.

On the 9th September 1875, about 9 a.m., four coal trimmers went into the after hold, each taking an unlighted candle, when one of them struck a match to light the candles and an explosion immediately followed. The flames reached nearly up to the mixed cross trees, but the fire went out shortly after the explosion. One of the crew was slightly burnt, and four coal trimmers burnt, one very seriously. The damage done altogether to ship and cargo amounted to about 85*l*.

"LOUISA THERESA," of Vannes, France, a wooden ship of 200 tons register, 20 years old, and classed 3/3–1–1, French Veritas.

Sailed from Cardiff for Mataro with a cargo of coals on the 16th January 1876, and on the same date, when in the Penarth Roads, an explosion of gas took place on board, owing, it is believed, by the gas coming up through the hatch in the Lazarette and igniting by the fire in the master's cabin.

"ATALANTA," of Greenock, O.N. 67914.

The Board of Trade forwarded to the Commission the following report, with its enclosure, from one of the Board of Trade's surveyors at Cardiff, relative to the explosion of coal gas on board the "Atalanta :"—

Board of Trade.
Cardiff, June 22nd 1876.

Explosion of Coal Gas on board ship "Atalanta" of Greenock, O.N. 67914.

In forwarding the account of above-mentioned catastrophe, I respectfully beg to suggest for the consideration of the Board the advisability of making it compulsory for *all* vessels to have a ventilator forward and aft, as it is at the *ends* of the vessel that gas always accumulates. There have been six or seven explosions of coal gas on board vessels here since I have been stationed at this port, and in every instance the explosion has been either at the forward or after end of vessel.

More elaborate means of ventilation may be suggested, but the use of an ordinary iron cowl ventilator at each end of vessel would, I think, be both efficient and simple, and would keep the space at ends of vessels clear even if the hatches should be accidentally closed, thus preventing much loss of life and property by such explosions as this.

Of course this plan is for sailing vessels only. Steamers would require a ventilator in each compartment.

(Signed) W. H. Neate,
Prin. Off. S. Wales.

The Asst. Secretary,
Marine Department,
Board of Trade.

Extract from "Western Mail" of the 20th of June 1876.

Terrible explosion at Penarth. A ship shattered. Four seamen killed and many injured. Marvellous escape of a rigger.

The most disastrous explosion that ever occurred on board a ship at Cardiff took place at 9 o'clock on Monday morning. The inhabitants of Penarth and the Bute Docks were thrown into the utmost consternation at the intense force and report made by the explosion. So great was the shock that many believed an earthquake had shaken the foundations of their dwellings. Persons, however, about the dock at Penarth and on Cardiff pier-head observed the flames and smoke issuing from on board a large ship lying in Penarth Dock, to the height of at least 200 feet, and on hastening to the scene found that a frightful explosion caused by an accumulation of gas from the cargo of coal had taken place on board the barque "Atalanta" of Greenock. The decks were blown up fore and aft from stem to stern, the rigging, sails, and spars broken and enveloped in a black and dense smoke. Immediate efforts were made to get on shore the injured members of the crew.

The "Atalanta," being outward bound and ready for sea, had most of her crew on board.

She completed loading on Friday last, having shipped 1,600 tons of the Glamorgan Coal Company's large steam coal.

The ship was so much damaged that fears were felt lest any of the crew could survive the accident, but the exploring party nobly pursued their labours, descending into the ship's hold, cabins, and forecastle, in search of the dead and dying. Men were found shockingly burnt about the head, arms, and body. These were speedily landed, and placed in the store of Mr. Clode, butcher, who kindly lent his premises on Penarth Wharf for the use of the wounded. Dr. Nell was soon in attendance, and ordered some of the cases to be removed without delay to the "Hamadryad," hospital ship. Three cases, however, he retained, viz., that of Matteo, an Austrian seaman, Donald McKerrel the carpenter, and Captain William Brown. The Austrian succumbed to the injuries he had received at 10.30 a.m., his body being removed to the Penarth mortuary. The carpenter was subsequently forwarded to the hospital ship very badly hurt, and Captain Brown, who also was much burnt about the arms and head, was conveyed to a private residence at Penarth.

While the wounded were being thus attended to, and that in a most efficient manner by Dr. Nell, it was discovered that Mr. Whitworth, chief officer of the "Atalanta," had been killed; also an ordinary seaman, named John Hamett. Both bodies were carried to the mortuary.

At a short distance from Mr. Clode's store another crowd was assembled around one of the dock lodges, wherein was found the mate of another ship, the "Killochan," of Greenock, most dangerously wounded. He was in the act of shaking hands with Mr. Whitworth, of the "Atalanta," on that ship's deck when the explosion occurred. Mr. Whitworth was killed, and Mr. Alexander Muir, mate of the "Killochan," was thrown about 40 feet into the air. In alighting, his head came in contact with a spar, contusing the skull. His right leg was at the same time broken. He lies, as stated, in a hopless condition.

As to the cause of this direful event, it has been clearly ascertained to have arisen from the accumulated gas from

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the cargo being ignited by a match lit by one of the seamen, named Antonio Pedro. He accompanied H. Ross, second officer of the "Atalanta," into the after hold. Mr. Ross carried a naked candle, and no sooner had Pedro struck the match to light the candle, than the explosion took place. Both of these men, who are badly burnt, are lying at the hospital ship.

The "Atalanta" is a ship of 1,116 tons register; built at Richmond, United States, in the year 1857. She is the property of Mr. C. S. Caird, of Greenock, and was bound from Cardiff to Hong Kong. Strange to state, the ship that was alongside of the "Atalanta" at the time, viz., the "Killochan," likewise belonged to Greenock.

APPENDIX III.

Admiralty Cases.

The following Papers have been received from the Admiralty relating to cases of Spontaneous Combustion or of Explosion in the Coal Bunkers of Her Majesty's Ships, and in certain of the Government Coal Stores.

H.M.S. "EUPHRATES."

(Spontaneous combustion in starboard coal-box.)

The following is an extract from the report of the captain of the "Euphrates," of the spontaneous combustion which occurred in the coal-box of that ship on the 9th April 1868.

H.M.S. "Euphrates,"
Bombay, 10th April 1868.

Sir,

I have to report for your information that an occurrence happened last night on board H.M. Ship under my command which might have been attended with very serious results, but for the watchfulness of the engineers on duty in the engine room at the time, and the measures which were adopted on my being informed of it.

The circumstances are as follows:—We had sighted Kolarba and Kautari Lights about 9 p.m., and had stopped the engines so as to wait till daylight this morning for coming into harbour to our moorings. Shortly before midnight the chief engineer (Mr. Eyers), reported to me that smoke was observed to be issuing from the starboard coal boxes, and he had no doubt that spontaneous combustion had taken place:—Fortunately there were only about 20 tons of coal in that particular portion of the bunkers. A hose from the donkey engine, and also from the foremost pump on starboard side of main deck, were immediately led into the coal box in question, and very shortly the place was flooded; and whatever combustion there was about the coals were completely put out. * * * *

In conclusion I beg to inform you of the cause of the combustion, viz., that Spencer's patent cement round the boilers is not properly secured, in fact is not secured at all; and from the great heat has got so dried up that it has fallen off, consequently leaving nothing between the great heat of the boilers and the coals behind them. I would therefore suggest that some means (iron bands or otherwise) may be adopted for boilers coated with the same composition for the purpose of keeping it from falling off.

I have, &c.,
Montagu B. Dunn.

H.M.S. "MINOTAUR."

The following is an extract of the Report received at the Admiralty of an explosion of gas which took place in the coal bunkers of H.M.S. "Minotaur" on the 25th June 1869:—

"On the 25th instant, while taking in shell, an alarm of fire was reported in the compartment in which the shell are stowed.

"The ship's company proceeded to their stations, and it was immediately ascertained that a slight explosion of gas had taken place at the starboard after coal bunker, opening into that compartment. The bunker has two manholes in the compartment, and three shoots from the maindeck.

"The temperature had been taken at midnight and showed 78° at the foremost and 68° at the after end, which were the same as on arrival at Spithead after steaming.

"A leading stoker had been sent to examine the boxes and had opened a manhole in the compartment. As he lowered his light it was extinguished by a rush of gas, and he, as well as the gunner's mate at the shell-room hatch, believe that they saw a slight explosion. An A.B., who was sitting on the lid of a shoot on the main deck, felt the lid move under him. He got off and it was lifted six inches, and he also believes that he saw flame.

"The rush of gas brought with it a good deal of coal dust, and there was for a moment an impression amongst the men working at the shell whips, that a fuse had ignited.

"The bunker was cleared and the coal transferred to other places, but no trace of fire could be discovered among them, or anything which would appear to give rise to fire damp. They appeared dry and in good order."

The Inspector of Machinery on being called on for his opinion as to the cause of the explosion, reported as follows:—

I have the honour to report that in my opinion the explosion alluded to as having occurred on board H.M.S. "Minotaur" on the 25th inst. was caused by an accumulation of gas (carburetted hydrogen) being pent up in the coal bunkers, and having no means of escape by which, on being released by the stoker with the light, on his removing the cover caused it probably to ignite. This gas is constantly being generated and evolved more or less with all kinds of coal, but accidents are usually guarded against by having the bunker covers removed daily for a few hours, when the gas passes off and mixes with the atmosphere in such small quantities as to be imperceptibly felt; but as the covers are mostly in the cable tier in this ship, it would not be safe to remove them daily to allow the gas to escape; therefore means should be adopted to carry it at once into the atmosphere.

I would suggest in vessels of this class, where large quantities of coal are stowed (remaining as it does a long time in the ship), to have a ventilating pipe fitted from the coal bunkers leading to an outlet on the upper deck where the gas might freely escape; this, together with removing the coal bunker covers daily when in harbour, would prevent a recurrence of such an accident (when at sea under steam, the furnaces will keep the coal bunkers clear of gas).

I beg most respectfully to bring to your notice the evil of allowing water to pass into the bunkers, whilst washing decks before time has been given to replace the covers after coaling ship. This practice is very dangerous, more especially with Newcastle coal, as moisture causes heat and gas to be evolved very rapidly, and in this kind of coal, where iron pyrites are present in considerable quantities, the danger is all the greater (it does not however always follow that the temperature is increased when the gas is given off).

The Admiralty then issued the following circular to the Fleet, inclosing the extract quoted above from the report of the explosion on board the "Minotaur."

(Precautions against accumulation of gas in coal bunkers.)

Circular No. 44. Admiralty,
July 29th, 1869.

The accompanying report having been received from the "Minotaur" of an explosion of gas having taken place in the starboard after coal bunker of that ship, on a light being lowered through one of the man holes, the attention of all officers commanding Her Majesty's ships is called to the necessity of opening the lids of coal bunkers occasionally so as to allow of the escape of foul air, and prevent the accumulation of gas, which is constantly being evolved, more or less, as regards all descriptions of coal.

Care should be taken to prevent water passing into the bunkers whilst washing decks, before time has been given to replace the covers after coaling, such practice being very

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dangerous, especially with Newcastle coal, as moisture sometimes causes the rapid generation of heat and gas.

By command of the Lordships,
VERNON LUSHINGTON.

To all Commanders-in-Chief, Captains, Commanders, and Commanding Officers of Her Majesty's ships and vessels.

H.M.S. "MEGÆRA."

(Heating of coal in the bunkers.)

The following is an extract from a letter dated 7th January 1870, reporting the proceedings of H.M.S. "Megæra":—

On December 26th the coal in the starboard wing bunker was found to be heated, temperature 130°, which I ordered to be used at once; but the temperature still increasing to 145°, I deemed it advisable for the safety of the ship to clear the bunker, which was done by getting up and starting the coal on the main deck, and also by increasing the revolutions of the engines and the expenditure of coal. A moderate breeze from the southward having sprung up on the 27th December, the ship had been placed under sail and the fires burned down, but as the coal in the port bunker also began to heat temperature 130° to 132°, I gave directions for the steam to be got up again, so that the coal might be used and the heated place arrived at, as from the quantity of cargo stowed on the main deck as well as the coal already got up, there was no more space for stowage there.

The wing bunkers are now quite clear of coal, and the temperature of all the bunkers has assumed its normal condition.

Commodore Dowell, with a view to ascertain the cause of the high temperature of the bunkers, ordered an inquiry, of which the following is the report:

H.M.S. "Megæra," Ascension,
SIR, January 11th, 1870.

IN compliance to your memo. of this date we came on board this ship to inspect the bunkers and endeavour to ascertain the cause of their dangerously high temperature, and have now the honour to inform you that we are of opinion that the temperature 145° while steaming and that immediately behind the boilers is not a dangerous one, but it being a sudden rise from that of the usual temperature, viz., 90° had been we are of opinion that the removal of the coal from that part was advisable.

Every proper precaution to prevent undue heating by opening the lids, &c., appears to have been taken.

The bunkers appear to have sufficient ventilation, and we do not see that any alteration or improvement can be made.

We cannot attribute the increased and sudden rise in the temperature of the coal to any other cause than its nature (Hirwain's Diamond Coal) which is of a softer texture and appears to emit gases more freely than the other, viz., North Country, as the different temperature in similar heated parts of the bunkers where these coals were stowed were Hirwains 146° and North Country 90°.

We have, &c.
(Signed) J. BURGESS,
Commander H.M.S. "Pandora."
A. MILLS,
Chief Engineer H.M.S. "Rattlesnake."
J. DALTON,
Engineer H.M.S. "Pandora."
H. M. SMALL,
Engineer H.M.S. "Rattlesnake."

The Commodore forwarded these reports to the Admiralty with the following letter.

"Rattlesnake" at Cape Palmas,
SIR, February 18th, 1870.

THE officer commanding the "Megæra" having represented to me that on his passage from England to Ascension, the coal in the bunkers became excessively heated, and that he had deemed it necessary for the safety of the ship to clear the two wing bunkers, I ordered an inquiry into the particulars of the circumstances with a view to ascertain the cause of the high temperature of the bunkers, and whether anything could be done to prevent it again happening.

The report of the inquiring officers is forwarded herewith, and it would appear that although the rise in the temperature of the bunkers was sudden, and sufficient to create some anxiety, it never reached a dangerous pitch. The bunkers are reported to be well ventilated, and precautions were taken to prevent any undue heating.

If the statement made to the inquiring officers in reference to the excessive heat generated in the bunkers from Hirwain diamond coal is correct, it would appear that that description of coal is not fit for the service; but their Lordships are doubtless in possession of information from other sources which will enable them to form a correct opinion as to the qualities of the kind of coal supplied to the "Megæra."

I have, &c.
W. M. DOWELL, Commodore.

On receipt of these reports the Admiralty called for a report from Sheerness of the particulars of the coal supplied to the "Megæra," from whom they were received, &c.

The following are copies of this report and its inclosures:

Sheerness Yard,
SIR, April 4th, 1870.

WITH reference to your minute on Superintendent of Stores, Order N.S. $\frac{11}{1765}$, of the 1st instant, directing us to report the particulars of the Hirwain Welsh coals supplied to the "Megæra" on the 12th October last, from whom they were received, &c., we have the honour to report that these coals were received from the Hirwain Coal Company under agreement of 5th, and Superintendent of Contract's letter of 15th May last, observing the coals are not called Diamond, that being the name of the ship from which they were delivered.

The cargo was carefully inspected prior to breaking bulk in accordance with Admiralty Order S.T. of the 28th April last, and the following report inserted on invoice of receipt, viz.:—

28th July 1869. The coals, Welsh S.V. have been surveyed in accordance with the instructions, and there is nothing in their appearance to prevent immediate delivery.

In addition to which, the cargo was examined during delivery and found to consist of the same quality of coals as seen on first inspection.

During the delivery of the coals a trial of their evaporative power was made on board the steam-tug "Otter" attached to this port, and the result reported in officer's letter of the 4th August 1869, a copy of which is forwarded herewith.

Subsequent trials of this coal mixed with North country coals were made at the coal testing boiler in this yard in accordance with Mr. McCulloch's wishes. See officer's letter of the 12th August 1869, copy herewith.

Their condition when issued to the "Megæra" was the same as at the time of their receipt.

We have, &c.
R. COBBETT, Storekeeper.
A, B. STURDEE, Master Shipwright.

Sheerness Yard,
SIR, August 4th, 1869.

WITH reference to your memorandum on Superintendent of Contracts, Order 1591, of the 19th ultimo, directing the officers to make a very detailed and particular report as to the quality of the Hirwain coals lately delivered at this yard, under purchases made by Mr. McCulloch. We have the honour to report that a cargo of the Hirwain coals has arrived at this yard, and upon making the usual trial at the coal-testing boiler in the course of its delivery, it was found that the rate of evaporation in cubic feet per hour was very much below the average, and the quantity of refuse produced excessive, it was therefore deemed expedient to make a further trial in the boiler of one of the harbour vessels attached to this port, and in conformity with your directions this trial has been made on board the "Otter."

We find under these circumstances the rate of evaporation extremely low, the fires burning very sluggishly, requiring the constant use of the pricker to produce even the rate of evaporation obtained, and the quantity of cinder and refuse proportionately large.

A trial with Nixon's Navigation coals in the same boiler has been made for special comparison, and the results show the Hirwain coals to be of very inferior quality, unfit for the service, and subject to the rejection provided for by the letter of 6th May last, from the Hirwain Coal and Iron Company to the Admiralty.

The coal per "Diamond" has been rejected accordingly on the invoice.

A tabular statement of the result of the trials of the Hirwain and Nixon's Navigation coals for comparison is forwarded herewith.

(Signed) A. B. STURDEE, Master Shipwright.
J. BANNISTER, Engineer.

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SHEERNESS YARD, 4th August 1869.

Description of Coal.	Name of Vessel.	Date of Trial.	Pounds of water evaporated per lb. of coal consumed.		Cubic feet of water evaporated per hour.		Percentage of			Smoke.	Remarks.
			Calculated at the temperature of the feed.	Calculated at 100° constant temperature of the feed.	Calculated at the temperature of the feed.	Calculated at 100° constant temperature of the feed.	Ashes.	Clinkers.	Both ashes and clinkers.		
Hirwain coals -	"Diamond"	1869 2nd Aug.	6·273	6·432	34·40	35·27	34·87	·73	35·60	Very light.	Fires burnt very sluggishly, although every effort was made to facilitate the combustion of the fuel. The number of cubic feet of water evaporated per hour per foot of fire grate was only 1·07.
Nixon's navigation coals.	From store	3rd Aug.	8·295	8·513	81·66	83·81	8·00	1·02	9·02	Very light.	Fires burnt briskly, ordinary firing. The number of cubic feet of water evaporated per foot of fire grate per hour, 2·15.

Note.—These trials were made in an ordinary marine boiler; area of fire-grate 33·3 feet.

(Signed) A. B. STURDEE, Master Shipwright.
J. BANNISTER, Engineer.

The Captain Superintendent.

Sheerness Yard,
August 12th, 1869.

SIR,

WITH reference to our letter and report of the 4th instant on the quality of the Hirwain coal, lately delivered at this yard under purchases by Mr. McCulloch in which we stated that the rate of evaporation was extremely low and the amount of refuse excessive.

We have the honour to report that in obedience to your directions of Monday last, when Mr. McCulloch visited the yard with reference to the above report, we have made further trials in the boiler used for testing coals at this yard of the Hirwain coal mixed with North Country, the result, as will be seen by the annexed report, shows a much greater rate of evaporation and a reduced amount of refuse.

We are of opinion that this coal may be used mixed with bituminous coal, although it is not adapted for burning in ordinary furnaces (without blast) in its unmixed state.

(Signed) A. B. STURDEE, Master Shipwright.
J. BANNISTER, Engineer.

(Copy.)

SHEERNESS YARD, 12th August 1869.

Description of Coal.	Name of Vessel.	Date of Trial.	Pounds of water evaporated per lb. of coal consumed.		Cubic feet of water evaporated per hour.		Percentage of			Smoke.	Remarks.
			Calculated at the temperature of the feed.	Calculated at 100° constant temperature of the feed.	Calculated at the temperature of the feed.	Calculated at 100° constant temperature of the feed.	Ashes.	Clinkers.	Both ashes and clinkers.		
Half Hirwain Half Cowpen Hartley.	"Tam O'Shanter" From store	1869 10th Aug.	7·341	7·574	31·37	32·37	1·96	1·90	3·86	Very light	Wind, W. & N.W.
Three quarters Hirwain One third Cowpen Hartley.	"Tam O'Shanter" From store	11th Aug.	7·942	8·194	31·90	32·91	1·88	2·00	3·88	Very light	Wind, W. & N.W.

Memo.—The front of boiler and the door of boiler-house face the north.

(Signed) A. B. STURDEE, Master Shipwright.
J. BANNISTER, Engineer.

The Captain Superintendent.

Subsequently the Admiralty wrote the following letter, directing the Superintendent of H.M. Dockyard at Malta to call upon the commanding officer of the "Megæra" to state whether any steam pipe passed through the bunkers in question:—

Admiralty, S. 88.
June 18th, 1870.

SIR,

I AM commanded by my Lords Commissioners of the Admiralty to request you to call upon the commanding officer of H.M.S. "Megæra," to state with reference to the report of the excessive heating of Hirwain coals in the bunkers on board that vessel, contained in his letter of proceeding of the 21st March last, whether a steam pipe passed through the bunkers in question.

I am, &c.
(Signed) T. WOLLEY.

The Admiral Superintendent,
H.M. Dockyard, Malta.

To this letter the Admiral Superintendent at Malta forwarded the following reply from the officer in command of H.M.S. "Megæra," from which it is clear that no steam pipe passed through the bunkers of that ship.

H.M.S. "Megæra," Malta,
July 4th, 1870.

SIR,

IN compliance with directions from my Lords Commissioners of the Admiralty contained in your memo. of this day's date, relative to the excessive heating of Hirwain coal, as reported in my letter of proceedings of 21st of March last, I beg to inform you that no steam pipes pass through the bunkers of this ship.

I have, &c.
H. D. SARRATT,
Staff Commander in Command.

Rear-Admiral A. C. Key, C.B.,
Admiral Superintendent.

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H.M.S. "MALABAR."

(Spontaneous combustion in coal bunkers.)

The following is the report of the captain of H.M.S. "Malabar," of the fire which occurred in her coal bunkers on 24th February 1872.

H.M.S. "Malabar,"
Bombay, 2nd March 1872.

SIR,

I BEG to report that on the morning of the 24th February the coal in the bunkers was discovered to be on fire.

At 4 a.m., a strong smell of sulphur was observed by the men working in the bunkers behind the boilers, on both sides about the same time. These bunkers were immediately closed, and also the watertight doors and all ventilation stopped.

The doors in after end of the stoke-hole were opened, and the coal got out as fast as possible; much of it was found to be smouldering and heated and only requiring a little air to burst into a flame.

When the coal was sufficiently cleared away, a hose was got into the bunkers and water played on the coals: the fire on port side was soon got under, but on the starboard side the fire seemed to have got more hold of the coals, and it was found necessary to flood this box entirely.

I am unable to give any cause for this occurrence; the coal was received at Malta from under cover only 16 days before (on the 8th February), and was perfectly dry and apparently well mixed, half Welsh and half North country.

The test tubes did not show any sign before the discovery and afterwards they never showed more than 111°, which is very little above the usual temperature when in the Red Sea.

Coals were described as—

Cowpen Hartley, received at Malta	-	April '71
And Fothergill's, Aberdare ,,	-	Sept. '71

It is fortunate the state of the coals was discovered so soon as it was, or the consequences might have been serious.

Those engaged worked well and quietly. I did not deem it necessary to stop the ship, and I believe at the present moment most of the officers and troops are unaware of the occurrence. No damage has accrued to the ship.

I have, &c.,
SHOLTO DOUGLAS.

H.M.S. "RATTLESNAKE."

(Spontaneous combustion in coal bunkers.)

The following is the report made by the chief engineer of H.M.S. "Rattlesnake" of the case of spontaneous combustion which occurred in her coal bunkers in February 1872.

H.M.S. "Rattlesnake," at Elmina,
7th April 1872.

SIR,

I HAVE the honour to make the following report on the Cowpen Hartley Coal (142 tons) received on board this ship from the Naval Depôt at Sierra Leone.

At 6 a.m., on the 20th February, smoke was discovered to be issuing from the coal boxes at the back of the starboard boilers.

The coals were removed into the stoke hole until the origin of the fire was discovered on the removal of about 20 tons.

The origin of the fire was to be attributed to spontaneous combustion, as shown by the discoloured appearance of the coal.

Every precaution was taken to ensure its being stowed quite dry in the boxes, and as it was observed to possess a large quantity of sulphur and iron pyrites special care was taken.

There being very little coal on the station, it became necessary to complete from the quantity in store at Sierra Leone, and care was taken that this coal was first consumed.

The coal was also indifferent for generating steam, and on being put into the furnaces, it burnt bright and brisk, but soon become dull and dead, causing extra work to the men from continued firing and pricking, thus showing it to be not only dangerous, but totally unfit for tropical climates.

I have, &c.,
H. W. ELGAR.

This Report was forwarded to the Admiralty by Commodore Commerell with the following memorandum:—

Forwarded for the information of the Lords Commissioners of the Admiralty, observing that I quite concur in the remarks of the Chief Engineer, that this coal was quite unfit for use in a tropical climate.

Fortunately the combustion in the bunkers was discovered in time to prevent any serious disaster and no damage was done.

As a preventitive against a similar occurrence, I have forwarded the particulars of this spontaneous combustion to the Naval Agent at Sierra Leone, for the information of the Officers Commanding H.M. ships coaling there, pointing out that this coal is by no means fit to supply to H.M. ships, and that every precaution is to be taken to prevent danger.

H.M.S. "GLASGOW."

(Spontaneous combustion in coal bunkers.)

The following is a copy of the report of the captain of H.M.S. "Glasgow," of this case of spontaneous combustion, which occurred on 22nd June 1872:—

H.M.S. "Glasgow," at Sea,
25th June 1872.

SIR,

I HAVE the honour to inform you that an alarm of fire was reported to me about 4.15 p.m. of the 22nd instant in the starboard after coal bunker, of H.M. ship, under my command under the following circumstances:—

On Mr. Pearson, the engineer of the 4 to 6 watch passing the bunker door in the stoke hole, he perceived a strong smell of smoke, and on entering the bunker found the smell stronger and smoke arising in considerable quantities, he immediately acquainted the chief engineer, and on its being reported to me the ship's company were assembled at their fire stations, and after a personal inspection of the bunker, where I found much smoke and heat, a considerable quantity of water was pumped into the bunker.

Immediate steps were taken to remove the coal, which was done as fast as possible, the pumps being kept going at the same time.

On removing the coals to the depth of about six feet, the greatest heat appears to have been reached, extending for a space of about four feet athwartships, the temperature shown by thermometer being about 135°, this great heat extending to a considerable depth.

By 11 p.m. the heated coals had all been cleared out, and the bunkers became cool, and on further examination no damage appears to have been done to the wood-work (sheathed with copper) which was in immediate contact with it.

The temperature of the bunkers, tested every four hours during the day, showed 98° the maximum.

I beg to enclose a list of the quantities and description of the coals received on board the ship since arrival at Suez, when the bunkers were empty, and, as far as I can ascertain, the heated coal in the bunker was a mixture of that supplied at Aden, Bombay, and Trincomalee, that of Bombay being the smallest and worse quality; but I am unable to say in what proportions, the total quantity in this compartment being about 82 tons.

The coals were received on board in a perfectly dry state, in tight lighters, the weather very fine and the sea perfectly smooth.

The bunker lids fit close, and no water has ever been discovered to pass through from the deck into the coals.

The door of this bunker in the stoke hole had been open since the last coals were received on board, and there being a run of coals in it for charging fires and culinary purposes, a large space had been consequently for some time free for the escape of gas and heated air.

I am unable to assign any cause for this overheating of the coals other than the result of spontaneous combustion.

I have, &c.,
T. MORTON JONES.

The Admiral Commanding-in-Chief forwarded this report to the Admiralty with the following remarks:—

"I do not believe that the fact of the coal being Welsh had anything to do with this occurrence. The 'Glasgow' called at Bombay immediately after the squadron, then under my command did, and I think it will be found that a large proportion of what she received there was North Country."

HER MAJESTY'S COAL STORES AT JAMAICA.

(Cases of spontaneous combustion.)

The following is a copy of the Report of Survey, dated 29th August 1872, on certain coal stored in H.M.S. Yard

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at Jamaica, from which it appears that two lots of North country coals (180 tons and 240 tons respectively), shipped to Jamaica in the colliers "Sophia and Jane," and "Mary Ann Johnson," (which arrived there 8th May and 9th July respectively,) were condemned as unserviceable in consequence of spontaneous combustion.

H.M.S. "RACOON," 29th August 1872.

A REPORT of SURVEY held on the following STORES, in HER MAJESTY'S YARD at JAMAICA, in pursuance of an ORDER, dated the 28th August 1872.

—	Species.	Estimated quantity tons.	Condition.	Cause of decay or unserviceableness.	Convertible or not, if the former, to what purpose.	Whether they should be sent to England, or sold in the country.	Remarks.
Lot 1.	Coal - - North Country. Ex "Sophia and Jane." (In store.)	270	Good and serviceable.	—	—	—	It is desirable that ships taking this coal should be informed that spontaneous combustion has occurred in portions of the same cargoes, and that it should be mixed in stowage with two thirds Welsh, as usual.
Lot 3.	Ditto - - Ex "Mary Ann Johnson." (In store.)	261					Ditto.
Lot 2.	Coal - - North Country. Ex "Sophia and Jane." (In the open.)	180	Unserviceable.	Combustion and heat and admixture with sand, &c., which last will inevitably be much increased by removal from its present position.	Not convertible.	Sold in the country.	This coal is of a highly bituminous nature. It has been stored in considerable quantities rather close under a roof of corrugated iron only, the temperature there having been as high as 97° in the day-time, while in the centre part of the store, the roof of which is additionally protected with boarding, it is seldom over 84°. From the quantity of coal in store there was but little ventilation. It may have become heated by getting damp at some time, but there is no evidence of such being the case.
Lot 4.	Ditto - - Ex "Mary Ann Johnson." (In the open.)	240		Ditto.			

The following is a report from the Commodore at Jamaica, of a further case of spontaneous combustion which occurred in the same stores.

"Aboukir," at Jamaica,
September 5th, 1872.

I HAVE the honour to report for the information of the Lords Commissioners of the Admiralty, that a portion of the North country coal contained in No. 1 store was again found to be spontaneously heated on the morning of Sunday the 25th instant, this time on the north side of the store.

2. The coal which heated this time is part of a cargo of "Cowpen Hartley, North Country Steam Coal," which was landed ex "Sophia and Jane," in April of this year.

3. The heated coal was fortunately not in the central store, and could therefore be removed, but for this purpose it was requisite to take down a portion of the wall.

4. It was found necessary to remove about 240 tons of coal which, with the amount which caught fire on the previous occasion, as reported in my letter No. 63 of the 24th ultimo, being reported unfit for issue to Her Majesty's ships will be sold by auction.

5. In case of erecting coal stores in this or similar climates in future, it would be in my opinion desirable to have wood or some non-conducting material underneath the roof sheathing, whatever it may be. The officers who surveyed the heated coal report that whilst the temperature in the upper part of the store roofed with zinc sheets over wood was 84°, in the stores roofed with corrugated zinc without wood underneath it was 97°, and it was in the latter store that in both cases the coal caught fire.

6. I am inclined to think that the last-named cause, together with the inflammable nature of the coal, (for it appears to contain a considerable quantity of sulphur and iron) and the want of ventilation are sufficient to account for the spontaneous combustion.

7. The better ventilation of the coal stores has been in progress since the first fire occurred.

I have, &c,
A. F. R. DE HORSEY.

On the 7th November 1872 another case of spontaneous combustion in the Jamaica coal stores was reported to the Admiralty. The following is a copy of the report:—

H.M.S. "Aboukir," at Jamaica,
SIR, 7th November 1872.

I HAVE the honour to report that a portion of the coal contained in No. 2 Store was on the 31st ult. found to be in a state of spontaneous combustion.

2. The coal which took fire this time (the third time in three months) is part of a cargo of Cowpen Hartley's North Country Steam Coal which was landed ex "William" in April of this year.

3. It was found necessary to remove about 74 tons, most of which will probably be serviceable.

4. The vicinity of one of the large doorways (which I had lately caused to be made in the walls of the depôt), enabled the heated coal to be removed without difficulty.

5. It will be observed that the coal which heated this time, as on former occasions is North country, the supply of which, received in the spring of this year, appears to have been of an inflammatory description.

I have, &c.,
A. F. R. DE HORSEY.

The following is a memorandum dated 2nd November 1872, drawn up by Mr. Rowsell, Director of Contracts, with special reference to the foregoing cases of spontaneous combustion in H.M. ships and coal stores:—

Several cases of spontaneous combustion having been reported within the last few months, noteably in the "Glasgow" "Rattlesnake" and in the coal store at Jamaica, and varying opinions having been expressed as to the cause, and as to whether Welsh or North Country coal is more liable to spontaneous combustion, it seemed right to ascertain the opinion and experience of the trade upon the subject.

As far as could be done during a hurried visit lately to South Wales and to the North, this has been done.

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The results are as indicated in the following extracts from notes of conversations at Cardiff and Swansea :—

"No. 1. No spontaneous combustion with best Cardiff "coal; there is with some of the Swansea coal, "especially with that class of coal which is shipped "to South America for copper smelting. Damp "promotes combustion.

"No. 2. None in best Welsh coal; no sulphur in it, "sulphur necessary to spontaneous combustion; "damp no doubt assists. All coals get damp in "coming from mine to vessel in open trucks, or "they get damp on board; some Welsh coals are "certainly sulphury *e.g.*, Dynevor; but never knew "a case of spontaneous combustion with best "steam coal. Firedamp attaches to even the best "coals, which should not therefore be hurried on "board ship. Open question as to ventilation of "coals after shipment, but hatches should not be "closed sooner than absolutely necessary.

"No. 3. There is spontaneous combustion as well as "firedamp with some coals; 20 tons of some coals "will defile a whole cargo; some coals having much "sulphur are bound to ignite though sent no "farther than Barcelona. Own (Resolven) coal "would not, nor would any of the best steam coal; "never knew of it. Has known of explosion with "the best coal. That is quite a different matter, "and preventable.

"At Newcastle, Sunderland, and Seaham.

"No. 4. Never knew of one case of spontaneous com- "bustion with Cowpen Hartley coal. That was "the case of a large cargo for Bombay, which got "wet."

"No. 5. Never had a case of spontaneous combustion, "combustion does happen when damp gets in.

"No. 6. Has not heard of spontaneous combustion "with Wear river coal. Gas coal has sometimes "given rise to explosions in contact with flame.

"No. 7. Lord Durham's agent never knew a case with "their coal. 'Fiery heap,' and 'duff heap,' has "been known to take fire of itself.

"No. 8. Never knew of spontaneous combustion of "North Country coal, except with gas coal on long "voyages."

The small coal seems to be more liable than lumps.

2. From these notes it would appear that danger from firedamp or the gas which clings to all coal whatever, is serious and certain to manifest itself where the coal freshly wrought has been hurried on board and quickly confined and flame has been allowed to come in contact with the escaping firedamp. This seems however to be a preventable danger. It has not shown itself in any of H.M. ships or depôts. It is, moreover, quite distinct from spontaneous combustion.

That occurs with coal. Welsh or north country, in which any large quantity of sulphur may be contained, is attested by much experience. It seems to be unknown in connexion with the best Welsh steam coal, and nearly so in connexion with best North Country, though Mr. Fothergill, the fitter of the Cowpen Hartley Colliery, furnished the only instance given in these notes of combustion which took place in some of their coal accounted the best in the North. Liability to spontaneous combustion seems to turn upon the greater or less amount of sulphur contained in a coal. Sulphur in some degree and in some shape exists in all coal. Its presence in a large degree is indicated by yellow patches of sulphide of iron, commonly called "brasses," whereof 3,500 tons were stated in a recent letter from Mr. Hunt, of the School of Mines, to have been picked out of coal in the northern district in one year. These "brasses" exist also in Welsh coal, and it is reasonable to attribute their absence in cargoes shipped on Government account, as much to the vigilance of the inspection by the Government Inspector there (now Mr. Traill), as to any original purity of coal, or of intention on the part of coal owners. The elimination of "brasses" from north country coal shipped on Government account, and prevention of shipment of sulphur-bearing coal, would be one of the most useful and desirable functions of a coal inspector in the North.

Damp or wet seems to be indispensable to the process of chemical change, whereof one effect is spontaneous combustion. With every care it is impossible to guarantee absence of wet on board ship, or in transit of coal to ship. Even in depôts, especially abroad, it is practicably impossible to ensure perfectly dry storage.

5. It would appear, therefore, that too much care cannot be taken to secure coal for store abroad, and for use in ships, which shall contain a minimum quantity of sulphur.

6. Would it not be as well to ask Mr. Hunt if he can state what is the maximum amount of sulphur permissible in coal, so as to render it safe from spontaneous combustion?

7. Endeavours should perhaps also be made to secure analysis of all the coals used by the Admiralty.

The analyses have doubtless been made, if so, all that will be needed will be to collect the results.

F. W. ROWSELL.

H.M.S. "DEVASTATION."

(Explosion of gas in coal bunkers.)

The following is a copy of the report received by the Admiralty of an explosion of gas which took place in the coal bunkers of H.M.S. "Devastation," on 1st June 1874:—

H.M.S. "Devastation," Portland,
1st June 1874.

SIR,

I HAVE to report that this morning an explosion of gas took place on board Her Majesty's ship under my command in the starboard centre upper coal box, under the following circumstances.

At a quarter before 5 a.m., the two cook's assistants named in the margin surreptitiously removed the lid of the escape man-hole of the coal-box, which is immediately abreast of the officers' galley, in the breastwork deck. Hill carried a naked light, and was seated on the deck with his feet in the bunker resting on the coal, and was, it appears, stooping with his light to pick out lumps, when there was an explosion which severely burnt him about the face and neck, rendering his removal to sick quarters necessary.

Frederick C. Captain's Cook's Assistant, and Joseph Curtis, Ward Room Cook's Assistant.

The coal in the bunker was a mixture of two thirds Welsh to one third of North country; it was shipped here on Tuesday last.

The bunker was nearly full, and the explosion was confined to the aperture.

The temperature was 66° Fahrenheit, and there was no indication of heat or damp when the box was searched immediately afterwards.

I have, &c.

FREDERICK W. RICHARDS, Captain.

The captain of the "Devastation," on being called on to state what precautions were taken to prevent accumulation of gas in the bunkers with reference to Circular No. 44 of 29th July 1869, issued after the case of the "Minotaur," reported as follows:

H.M.S. "Devastation," Portland,
3rd June 1874.

SIR,

THE system pursued in the coal boxes in the "Devastation" is as follows:—

Every morning after the decks are finished, the escapes are opened and a Clanny's safety lamp lowered into every lower box; the boxes remain open during the day, and are closed after evening quarters.

For keeping the lids watertight, a soft gasket, soaked in oil and coated with tallow, is fitted to each manhole; these gaskets are removed when coaling, and afterwards the grooves are cleaned, and they are carefully replaced; these precautions were taken after coaling on 26th May before any water was used on the deck, and there was no indication whatever of water having got into the box in which this accident occurred, the coals were and are perfectly dry.

The chief engineer, accompanied by an engine-room artificer, had thoroughly examined the box and gauged the coal for quantity on Friday the 29th, when there appeared to be no indication of gas being evolved.

The "Devastation" has two tiers of coal boxes, the lower are all fitted with water-tight escapes, which are open daily, as I have stated, for about 12 hours.

The upper boxes are fitted with the usual circular manholes, only these run the length of the breastwork decks, and, as a rule, these boxes are not opened on Saturday or Sunday, nor have they been on this occasion since they were closed on Friday evening.

Having in view the rapidity with which the gas must have been generated on this occasion, it would be well if escape valves were fitted to these boxes when opportunity offers, as it is manifest that the lids of coal bunkers cannot always be off on a ship's deck,

FREDERICK W. RICHARDS, Captain.

The papers were then referred to the officers of the yard at Portsmouth.

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The master shipwright's and engineer's department reported as follows:

In compliance with the directions contained in your memo. of the 11th on Comptroller's letter of the 10th inst., S $\frac{2}{8}\frac{1}{8}\frac{2}{5}\frac{2}{0}$, and accompanying reports of the officers of H.M.S. "Devastation," respecting an explosion of gas in the upper coal bunkers of that vessel.

We have the honour to report that we are of opinion that had the gratings been used frequently in the deck-plates instead of hermetically sealed covers, as stated, (by putting gaskets soaked in oil and coated with tallow,) the explosion would not have taken place.

In order to prevent a like occurrence, and to avoid the inconvenience of having the covers removed, in the deck within the breastwork, we would suggest that ventilators may be fitted between the beams, as shown in red on the accompanying sketch.

The captain of the steam reserve made the following report:—

In compliance with your minute of the 11th instant on Comptroller's letter, dated 10th June 1874, S. $\frac{2}{8}\frac{1}{8}\frac{2}{5}\frac{2}{0}$, desiring me to report my opinion upon the accumulation of gas in the bunkers of the "Devastation," I have the honour to report that it appears from Captain Richards' letter that the bunker lids were left on from Friday to Monday, during which time the gas accumulated.

2. I am of opinion that all bunkers should be fitted with means for the escape of gas, independent of the bunker lids, which should be taken from the crown or highest part of each bunker into the uptake, mast, or ship's side, as might be most convenient in each case, the principle being that each bunker should be fitted with independant means of relieving itself from gas; and I would submit that such means should be fitted to the "Devastation" as soon as possible, and be provided for in the drawings of all ships in future.

The Admiralty then issued the following order dated 27th June 1874.

The Superintendents at Chatham, Sheerness, Devonport, and Pembroke, are informed with reference to the enclosed papers respecting the explosion of gas in the coal bunkers of the "Devastation" that provision is to be made in the ventilating system in all ships in future for carrying off any gases generated in the coal bunkers.

H.M.S. "DAPHNE."

(Explosion of gas in coal bunkers.)

The following is the Report of the commander of the "Daphne" of an explosion of gas which occurred in her coal bunkers on the 11th August 1874:—

H.M.S. "Daphne," Trincomalee,
SIR, 13th August 1874.

I HAVE the honour to inform you that about 6.50 a.m. on the 11th instant, one lid of port after and one of starboard after bunker were blown off, and a flash of flame was observed. Smoke was then seen ascending.

The officers and crew at once assembled at fire stations, the hoses being ready in a very short space of time; but it was not deemed advisable at first to wet the coal.

Parties of men were organised to clear out the coal into a lighter, the smoke continuing to increase, accompanied by heat, and a stoker in shovelling out the coal to the stoke hole, came upon a small portion of burning coal. I then ordered the pumps to be hove round, and in ten minutes the men were able to resume work, occasionally assisted by the pumps.

The temperature of the bunkers reported during the first and middle watches, and also at 6 a.m. was, port bunker, 95°; starboard, 92°; this was close to the seat of fire, and was not considered beyond the usual average, as the main steam pipe runs through the port bunker causing an increased temperature of several degrees to that of the starboard side.

The port bunker is always highest.

The coal (Nixon's Steam Navigation and Davidson's West Hartley two thirds to one third), was got in at Aden in a perfectly dry state, and appeared so on the 11th.

This combustion appears to me to have been caused by some peculiarity of the mineral, and may possibly have been acted on by the temperature of the steam pipe.

I decided to land the greater portion of this coal, viz. 130 tons, and shall give the bunkers a thorough ventilation, embarking only a portion of it for present use in the foremost bunker when I again complete.

I have, &c.
C. E. FOOTE, Commander.

A report having been called for by the Admiral Commanding-in-Chief on the station as to "when the bunker "lids were last taken off" previous to the accident, it appeared that through inadvertence, the bunker lids previous to the accident, had not been lifted off since the 31st July, although it had been the custom to do so every Friday.

The explosion was thus accounted for.

APPENDIX IV.

INFORMATION collected by CIRCULARS issued by the COMMISSION.

A. SHIPOWNERS.

About 250 of the following PAPERS of QUESTIONS were issued to SHIPOWNERS connected with the COAL TRADE.

QUESTIONS TO SHIPOWNERS.

1. Has spontaneous combustion or explosion ever occurred in any of your coal-laden ships?
2. If so, state all the circumstances of each case as fully as you can, on one of the inclosed forms.
3. What system, if any, of ventilation do you adopt for the holds of your coal-laden ships generally?
4. What proportion does the tonnage of your coal cargo usually bear to the N. R. tonnage of the vessel?
5. What kinds of coal have been shipped in your vessels? State the names of the collieries, with seams, and whether double or single screened.
6. How long has the coal generally been taken from the pit before shipment?
7. What precautionary measures, generally, do you adopt in your ships against spontaneous combustion or explosion, and what provision do you make for dealing with fire from these causes should it occur?
8. Have you any remarks to make, or suggestions to offer to the Commission on the subject of their inquiry?

Please write "Confidential" against any of your answers which you desire to be so treated.

The following are some of the REPLIES received to these QUESTIONS.

From Mr. THOMAS HENDERSON, South Shields.

"Columbia." (See p. 85.)

1. Only on one occasion, and the report by the commander accompanies this.

3. Never put any ventilators (except on the occasion above referred to, Article No. 1) in our ships' holds, but instruct the captains to keep the fore and after hatches off when at sea whenever the weather allows, so that any gas which may be evolved may escape.

4. From one fourth to one third over and above the net register tonnage.

5. We have shipped all kinds and descriptions from the best Hartley steam coals (from nearly all the north country collieries) down to the smallest smithy coals. Cannot give

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the name of any particular seam, as when the ship goes to the spout only know that the coals are coming from a certain colliery, and do not know what shaft they are worked from.

6. Cannot answer this positively; but of late years should say that very few hours elapse between the time of the coals being brought to bank and being shipped in the vessel.

7. Never take any further precautions than named in Article No. 3. With regard to dealing with fire, we are so satisfied that without ventilation it will not occur that we have not given it particular attention, except to point out to any young captains the measures taken by Captain Ramsey, whose report accompanies this.

8. None further than I think ventilation is unnecessary and dangerous, as by bringing the atmosphere in contact with the gases given out of the coals, the agent that is required for combustion is being introduced.

From Messrs. T. Beynon & Co., Newport (Mon.).

"Usk." (*See* p. 66.)

1. Yes, on board the barque "Usk" in 1861. I think this vessel loaded a cargo of smelting coal at Swansea in the usual way, and took fire when at sea, 98 days from loading port.

3. My own opinion is that ventilation in ships laden with smelting coal is of very little use; the above-named ship was ventilated with shafts from each hatchway.

4. About seventy per cent. of the register tonnage over the register tonnage would be about the ship's cargo; thus a ship of 400 tons N.N.R. would carry 680 tons of coal.

5. Both smelting and steam; steam coal generally is double screened on shipment, smelting coal not at all.

6. My experience goes to show that the coal is shipped as soon as possible after being taken from the pit.

7. In steam coal-laden ships I ventilate them; in ships loading smelting coal I endeavour to get the cargo shipped dry and in dry weather.

8. To prevent the spontaneous combustion of coal I would recommend that the cargoes should be shipped in casks or barrels, which would in my opinion be a sure preventative.

From Messrs. T. Beynon & Co., Newport.

"Usk." (*See* p. 66.)

1. Yes.

3. The plan that has been in use at Liverpool.

4. About 60 per cent. over the net register tonnage.

5. Small coal or smelting coal; no well authenticated case has come to my knowledge of ships having taken fire through spontaneous combustion of large double-screened steam coal.

6. Shipped almost immediately it can be sent down from the pit.

7. In ships of mine loading coals liable to explosion from gases, I have always given orders that the hatches are not to be put on until 24 hours after the ship has been completely loaded, and never put on during loading. I never had an accident with this description of coal in any of my ships.

8. I had a barque called the "Usk," 338 tons register, which loaded a cargo of smelting coal at Swansea and sailed from that port for Valparaiso. In July 1863 she took fire when she was out from Swansea 94 days, and at the time distant from Valparaiso about 200 miles. I attributed the fact at the time to the coal being shipped in wet weather, but I forget now the exact circumstances of the case; the captain, however, stated that the first intimation the crew had of the ship being on fire was the great heat that was felt in the forecastle one morning, and upon opening the forehatch to ascertain the cause, the flames burst up as high as the fore top, and the crew had to abandon the ship at once, taking to the boats, not having time to save their effects; they were picked up and taken into Valparaiso; the ship was fitted in the usual manner with wooden ventilators, as was usual then at Swansea.

Since the "Usk" was lost I have sat as magistrate to investigate two cases of ships that were destroyed by spontaneous combustion of their coal cargoes. Both ships were loaded in this port with house or smelting coal; it was shown during the investigation that the weather had been wet when the coals were shipped, and samples of coal similar to their cargoes produced in court were proved to contain a large quantity of iron pyrites; about the same time I had a ship of my own that I loaded here myself with a cargo of smelting coal, made the passage to Coquimbo in 98 days, and in perfect safety, and the captain wrote me that the coal was quite cool during the whole time the ship was discharging. The reason my ship did not take fire, I think, was that I loaded a superior kind of coal that contained very little, if any, pyrites of iron. The two ships that were burnt caught fire when they were out from their loading port between 90 and 100 days. In the course of the investigation alluded to above, the chemist that was sent down by the Board of Trade stated that sulphurous acid gas (I think it was), if introduced into the hold of a ship that was on fire (from spontaneous combustion of a coal cargo), under certain conditions, would extinguish the fire; he described the method, which to my mind appeared cumbrous and expensive; the chemist undertook to demonstrate in a practical manner the value of his recommendation by putting the fire out in the court house, but this he failed to do.

I have thought over this subject of spontaneous combustion of coal cargoes very carefully, and I believe that although ventilation is of great value in cargoes of coal liable to emit gases that are explosive, it is of very little use in cargoes of coal that are liable to take fire from spontaneous combustion; my plan to prevent the latter (and I think it is worthy of consideration) is this:—Stow the coal in ships' holds in barrels, old flour barrels would do; one of the causes of spontaneous combustion in my opinion is that the coal is stowed in a mass, it lies close, and no system of ventilation could be of use; but in the plan I propose of stowing the coals in barrels it would be stowed in small parcels, each parcel isolated, while the air that would circulate between the interstices of the casks would tend to keep all cool; but the very fact of stowing the coal in small parcels, each distinct and protected from each other, would in my opinion be a sure preventative against ignition. I have mentioned my plan to several of my friends who are deeply interested in this question, and they agree with me that the method I propose is an effectual one to prevent spontaneous combustion; they demur, however, as shipowners to the expense that would be incurred in finding the barrels, and the loss that would be sustained by the ship taking a smaller cargo of coal in barrels than she would in bulk. My answer to this is that the loss of one ship (to say nothing of the consequent risk to life) would go a long way to providing barrels, and if merchants are desirous of shipping a dangerous class of goods such as coal, liable in its nature to spontaneous combustion, they should pay a higher freight for its carriage in proportion to more harmless goods, so as to enable the shipowners to take similar precaution to those I have pointed out in order to enable him to carry the coal without risk to life or property, and without entailing a serious loss to himself.

From Mr. William Thomson, Craig Binning, Uphall.

1. Yes; in five cases.

3. When the quantity of coal is a mere ballasting no ventilation; when a full cargo is taken the ships are carefully ventilated with wood, up and down each hatch.

4. When ballasted under register tonnage a full cargo about 25 per cent. above the register tonnage.

5. Duke of Buccleuch's Midlothian coal, all screened; Cowpen, Hartley, and Lancashire screened.

6. Unknown.

"Joanna," "Wanderer," "Annie Laurie," "May Queen," "Palmyra." (*See* p. 87.)

From Messrs. Charles Hill & Sons, Bristol.

1. No case of explosion; a cargo of smelting coals heated very much, but did not ignite.

3. All our ships intended to carry coals are fitted with a platform, 18 inches or more off the bottom, and 2 to 3 feet at bildges, and have ventilators as follows, viz., one large galvanized iron, one through the top gallant forecastle down to lower hold with bell-mouth at top, and one, sometimes two, smaller ones as far aft as they can be placed. Wood ventilators through each hatch with lapping battens (similar to venetian blinds) so that they cannot get choked.

4. 35 to 45 per cent. over net register tonnage.

5. All the different kinds of steam coal loaded at Cardiff and Newport, also some cargoes of smelting coals, and a few cargoes from the North of England.

6. Coals are generally shipped shortly after leaving the pits, and it frequently happens that that the loading is interrupted waiting for coals to come down from the pits.

7. Each ship supplied with a Davy's patent safety lamp (same as used in coal mines,) and instructions given that no other light is to be used in the ship's hold or store-rooms under the main deck; a portable fire engine and plenty buckets supplied each ship. The captains are instructed

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to go below frequently and examine the cargo and test the heat of same with thermometer.

8. I attach much importance to the keeping the *bottom* of a coal cargo *dry* and *cool*, and hence consider a platform most essential. Cargoes of coal are looked upon as not liable to damage, and are generally loaded right on the bare ceiling as no other cargoes are, and the bottom of the cargo is often wet before leaving the docks, strict attention to the pumps not being considered necessary with a coal cargo; ventilators, too, are much neglected, an impression prevailing amongst shipmasters that they are of no use, and they are often fitted in a carelessly and inefficient manner just to comply with the charter, frequently only a few feet in length so as to show at the hatchway. They should be fitted from the bottom and to project above the hatchway, and be piled round with knobs of coal as the loading progresses, to keep them from being choked with small coal. I may be permitted to mention that during the last 10 years we have carried 75,000 tons of coals south of the Equator, mostly round the capes, in ships 400 to 1,700 tons register, and the before-mentioned is the only approach to an accident connected with the cargoes. Last year one of four vessels took a cargo of 1,750 tons Merthyr steam coals from Cardiff, called with it at the Cape and Point de Galle (for a market,) and finally it was discharged at Singapore after being six months on board the vessel.

From Mr. E. S. Hill, Cardiff.

"Her Royal Highness." (*See* p. 87.)

1. Only one case of inconvenience by heating ever occurred with all the cargoes our ships have carried.

3. The cargo is stowed on a platform from 18 to 24 inches from the skin. We place a wooden shaft in each hatchway, and an iron ventilator in each end going down into the main hold. The captain is instructed to keep the hatches open as much as possible.

4. Something over a tonnage and a third.

5. Mostly steam coal double-screened from Nixon's Navigation, Powell's Duffryn, and others of the principal steam collieries, with a few cargoes of smelting coal, and some from the north.

6. It is not possible to answer this question as a matter of knowledge; but I believe, as a rule, large coal is shipped within 36 hours from its being taken from the pits, sometimes much quicker; small coal would usually be longer.

7. Vide reply to No. 3. In addition, the ships are all provided with Davy's safety-lamps and portable fire engines. The captains are told to carefully notice the temperature of the cargoes.

8. I think that the losses by reason of fire in coal-laden ships have been very much exaggerated, and in support of this opinion I have the honour to enclose for the information of the Royal Commissioners a paper which I compiled bearing upon this subject, and which was adopted, printed, and circulated by the Cardiff Chamber of Commerce.

It is an established fact that the Welsh steam coal is not liable to spontaneous combustion. No case has ever been known, but it is very liable to generate gas of a highly explosive character. To prevent accidents it is only necessary to observe the precautions already described.

I have known of several cases of explosion, but I believe in each instance a naked light has been incautiously used.

In the case of small coal and smelting coal I do not consider ventilation desirable. It may be desirable to stow the cargo on a platform for the sake of keeping it dry, but I attach more importance to preventing it getting wet whilst shipping, and of taking care to keep it dry afterwards. The practice of throwing greasy slops on top of the cargo is very much to be deprecated.

From Mr. William Buchanan, Greenock.

"Royal Family." (*See* p. 87.)

1. In one ship.

3. No particular system. Generally when ventilated in the shafts down each hatch, and sometimes with a trunk along the keelson; never had any heating when no ventilation used.

4. Fully register tonnage and third.

5. Do not know the names of the collieries, but have carried coals to India from Newcastle, Cardiff, Birkenhead, Glasgow, and Greenock, both single and double screened.

6. Don't know.

7. None excepting carrying a fire engine.

From Mr. J. H. Watt, Glasgow.

"Persia." (*See* p. 88.)

1. I may have owned about 30 ships at different periods which have frequently loaded coals, and have had only one case of combustion.

3. Wood ventilators.

4. About 140 p.c.

5. Chiefly from Lanarkshire, also Ayrshire and Wales.

6. Immediate shipment.

7. As a rule my ships were not insured. I have studied the subject carefully, and though the ships were ventilated I rather objected to it, and cannot give any suggestion to prevent such accidents.

From Messrs. J. Brymner & Co., Greenock.

1. Only in one about five years ago.
2. See form.
3. Ventilators in each hatch.
4. Varies say about register and third.
5. All kinds, Welsh, English, and Scotch.
6. Generally fresh.
7. As thorough ventilation as possible, and supply fire engines.
8. Except that great care should be taken in loading and proper ventilating.

"Glenmara." (*See* p. 2)

From Messrs. Stoddart, Brothers, Liverpool.

1. Yes.
2. "Vanda" and "Mindora" herewith.
3. Wood trunk along lower hold, and connected by upright trunks to the hatches.
4. Various. About one third to one half over the registered tonnage.
5. See paper herewith.
6. Cannot say.
7. Fire engines.
8. Cannot give any reason for fire breaking out. Do not think present system of ventilation is right. Water gets down the shafts. Becomes heated and the draught carries smoke up the shafts and feeds the fire.

"Vanda." "Mindora." (*See* pp. [illegible])

From Messrs. Hine, Brothers, Maryport.

1. Yes.
3. Very shallow ships, none. Deeper ships, on each side keelson with shaft communication through each of the three hatches.
4. In steam ships it depends upon the quantity of bunker coals shipped, and this depends upon the length of the voyage; including bunkers about double net register. In sailing ships 40 to 60 per cent. above net register.
5. Various kinds, in nearly all cases double screened.
7. Fire engines.
8. Coals (South Wales) have been shipped in my vessels under the same circumstances of weather, &c., as in the case of the "Cereal," but no symptom of fire showed itself, although the voyage was 40 days longer. I am therefore inclined to think that you must look to the nature of the coals themselves for the cause of so much spontaneous combustion. I am disposed to think there are some kinds that will take fire however dry they may be shipped, and however well ventilated. I never heard of a case of spontaneous combustion of coal shipped from this district (West Cumberland), and such a thing as a colliery explosion is rarely if ever heard of here. I merely name this to substantiate the opinion I have given.

"Cereal." (*See* p. [illegible])

I do not approve of the present mode of ventilation as I think the ventilators in the case of fiery coals act more as flues or draughts for the flames. In my judgment the most effective mode would be to divide the cargo into lots or sections entirely separate from each other by means of bulkheads extending from the bottom of the hold to the upper deck or to the top of the coal, such bulkheads to be double, say a foot apart, with sufficient cross pieces to prevent their being crushed together by the weight of the coal.

The objections to this plan would be its great costliness and the difficulty in carrying it out in ships with 'tween decks laid. The great advantage would be instead of having a large cargo lying in one mass in a ship's hold there would practically be two, three, or it might be four distinct lots with an open space of one foot between each.

I think the next best plan is to lay the fore-and-aft ventilators not in the very bottom of the ship on each side the keelson, but about halfway to the deck, say under the 'tween deck beams, thereby carrying them right through the centre of the mass of coal, where the heat always generates.

I also think it unwise to ship the coal as is now frequently done straight from the mines.

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From Mr. William Laing.

1. Yes. One instance of explosion, and one of spontaneous combustion.
2. See enclosure.
3. Permanent galvanized iron ventilators are fitted into each hold or compartment, one at each end of it.
4. Variable, about 11 to 7, exclusive of bunkers.
5. Nearly every kind shipped either at Newcastle or Cardiff has been carried.
6. Generally fresh from the pit.
7. The complete system of ventilation as above mentioned, and my ships all being steamers, are fitted with the usual engine pumps and ample length of fire hose.
8. I consider no coal-carrying ships safe, unless permanent iron ventilators with cowled tops are fitted into each hold or compartment, one at each end of it, forming down and upcast channels; further that naked lights should not be used in the holds on the voyage, as the gas has a tendency to accumulate in any empty or half-filled hold, especially at the fore end of the ship.

From the Secretary of the Swansea Merchant Shipowners' Company, Limited.

1. Yes, in the barque "Alpha."
2. She was laden with smelting coals for Valparaiso and orders. The coals fired when she was near Cape Horn. The ship was taken with difficulty to Stanley and partially discharged. An agent was sent from England who repaired the ship, and she proceeded to her destination.
3. To fill in between the keelsons or platform risers and level a little below them, lay the platform and place boards (trunk boards) fore and aft on either side of the midships stanchions, allowing of ventilation in both cases.
4. Generally the full cargo of coals, about register and half gross tons.
5. Smelting and steam.
6. Shipowners as a rule do not know.
7. The above-named for ventilation to comply with conditions of charter, relying not on that, but on the subdivisions of the cargo by same means. Steam coals are explosive, and should be ventilated, or at least the hatches should not be closed for, say, 48 hours. After that there is little escape of gas to be feared. Ventilation will not arrest the tendency to spontaneous combustion, but it will aid it when once set in. In that case the ship is closed up generally as a first attempt to smother the fire, but water has to be resorted to almost invariably.
8. Not more than is embodied in the above replies to questions.

From Messrs. R. & J. Craig, Glasgow.

1. In two spontaneous combustion, the "County of Nairn" and "County of Perth."
2. Fully stated as requested.
3. Ventilation through the main deck and one to bottom of hold.
4. Never more than N. R. tonnage of the vessel.
5. Roughrigg and Hamilton coal is always double-screened.
6. Direct from the pits.
7. Ventilation only. Leather fire hose in connexion with two rocking centre fire-engine pumps.
8. The only suggestion we can offer with a view to prevent spontaneous combustion is to build the ships in compartments of such size as to carry not more than 300 or 400 tons in each.

1. Two vessels, one total loss, the other put into Monte Video and took out cargo.
3. None heretofore, but would certainly prefer trunks at certain places.
4. About 75 per cent.
5. Both Welsh and North country, but have never known but one case of my own of North country, a cargo for Hull.
6. Shipped immediately.
7. Have not previously adopted any, but should do so if loading these coals again.
7. I shall be glad if my evidence would in any way assist to prevent such destruction of property, but would suggest that the captains of these vessels should be examined. I believe their evidence of much more importance than mine.

From Messrs. J. Kerr & Co., Greenock.

1. Yes, in ship "Isabella Kerr."
3. A wooden ventilator up each hatch, and one along keelson.
4. About 1·40 per cen
5. Main ell and splint coal.
7. Ventilation as above, and captains have instructions to open hatches in fine weather, and try heat by thermometers twice every day.

From Mr. Charles Beades, Lancaster.

1. Yes; "Channel Light," at Rio, October 1873.
3. Trunks fore and aft. Ventilation through deck and hatches.
4. 553 N. R., cargo 700 to 750.
5. Welsh or North country coal.
6. A short time only.
7. Ventilation. Force pump, hose, &c.
8. Allow no coal to be shipped until sufficient time has elapsed to allow of the gases to escape.

"Channel Light." (See p. 91.)

From Mr. J. S. Greive.

1. Yes, on board ship "Walter Baine," lately destroyed by spontaneous combustion. Crew saved.
2. See Rundell's book, page 46.
3. Ventilators in each hatch running along keelson by a tunnel, but I do not approve of it.
4. Generally 100 to 200 tons less than tonnage and half of net register.
5. Wishaw and Sunderland.
6. Cannot speak as to this.
7. Ventilators in each hatch; have not employed any other means.
8. Doubt very much whether the ventilators are not positively injurious. I have a strong opinion coal should be shipped dry. High-valued ships are practically shut out from taking coal charters on long voyages, because of the high rate of insurance on the ship; as a rule low-classed wooden ships must be employed, probably lengthening the passage, and consequently the risk of spontaneous combustion will be increased.

"Walter Baine." (See p. 92.)

From Mr. George Duncan.

1. Yes, in three cases.
3. Longitudinal shaft on each side of keelson and upshafts connected therewith coming out of each hatchway.
4. About 30 per cent.
5. Have carried all principal Hartley steam coal from Tyne and Wear, and from the chief collieries in Cardiff.
6. Cannot say, but believe much less time than formerly.
7. Cargoes ventilated, and ships provided with fire engine and head pump.
8. Being member of Commission can do so orally.

"Persia." "Indian Empire." "Khersonese." (See pp. 91, 92, and 97.)

From Messrs. W. & R. Wright.

1. Yes.
3. In all our wooden ships we have a wooden platform under the coal, and venetianed upright shafts which extend from under platform to top of each hatch.
4. This depends upon the model and age of the vessel and the voyage. Our last built wooden vessels are built with a view to carry large dead weight cargoes, and as a rule carry fully tonnage and half. Iron ships usually carry about tonnage and one third.
5. Wishaw coals from Dundee, West Hartley, from Shields, Lancashire, from Liverpool, North and South Wales, from Birkenhead.
6. We believe three or four days.
7. None but the above system of ventilation, which we have adopted for a long time now; it has acted well, and is in favour with underwriters. Engine hose, and buckets.
8. Merely this, that if our plan of platforming and ventilating was universally adopted the number of cases of spontaneous combustion would undoubtedly be diminished.

"Moorefoot." (See p. 93.)

From Mr. W. R. Price, London.

1. Have had two cases of spontaneous combustion and total loss, say, ships "Oliver Cromwell" and "Calcutta."
2. Both ships sailed from Shields for Aden. The "Oliver Cromwell" on the 18th June, and the "Calcutta" on 2nd July 1874. The "Oliver Cromwell" was burnt on 6th September 1874, in latitude 37° S., longitude 14° E. The "Calcutta" was burnt on 17th September 1874, in latitude 35° S., longitude 7° E., being respectively 80 and 77 days out. In both cases the fire was discovered in the main hatch ventilator.

The captain of the "Calcutta" was lost, so no protest giving exact particulars has been obtained; but from some of the men saved, I learn that there was no indication of fire till immediately before it broke out.

In the case of the "Oliver Cromwell," I have been told that there was no smell of gas prior to the fire, but that a peculiar vapour was noticed from time to time coming up he ventilator some days previous to the fire, which, how-

"Oliver Cromwell," "Calcutta." (See p. 94.)

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ever, was considered as simply indicating the ordinary sweating of the cargo.

3. Both ships were well ventilated by 4-feet ventilator from the top of keelson to the ceiling, and two horizontal ventilators of wood on top of beams a foot square midway between 'tween deck stanchions and the side of ship. These were connected with three 18-inch upright shafts going through each hatch, the sides of which were arranged like a venetian blind when two thirds open. This is the same system I have adopted successfully for 17 years with coal shipped from Birkenhead to the East.

4. The "Calcutta" was 1,372 tons net register, and had on board 1,802 tons coal. The "Oliver Cromwell" 1,112 tons register, 1,616 tons.

5. The coal in these two cases was, I believe, Howard's West Hartley, shipped on account of the Peninsular and Oriental Company. I cannot say whether it was screened or not, but should think it was shipped as screened, although I noticed a considerable amount of small coal in the main hatchway in the lower hold of the "Oliver Cromwell."

6. I believe the coal to have been taken recently from the pit, but I have no exact evidence on the point.

7. My captains have always been instructed to keep the hatches off whenever the weather permitted, and have always been supplied with plenty of good hose and a force-pump for working same.

8. Having carried coal largely during a period of 17 years from Birkenhead to the East without even a heated cargo, and having shipped it by tips as well as by barrows, I am led to the conclusion that in the losses above referred to there must have been some speciality in the coal rendering it more liable to spontaneous combustion than the North Wales coal, and this view is strengthened by the fact that at the same time two other vessels loaded in the same dock, I believe with the same coal, one of which, the "Euxine" was also burnt, making three out of four ships. The matter is specially referred to in a report from one of the officials of the Peninsular and Oriental Company to the directors (copy of which I enclose *), and I commend to your notice the fact that the fourth ship the "Cora" was not ventilated through the coal, and arrived at her port, although a portion of this cargo got wet with rain and hail during loading, and was therefore more liable to heat.

I have been told by the members of the crews of the "Oliver Cromwell" and "Calcutta" that the seat of the fire in each case was well down in the lower hold under the main hatchway, and as the bulk of the cargo is shipped in this hatchway, there is necessarily a greater density in the mass and a larger accumulation of small coal.

The height of the tips from which it was shipped in the Tyne has a tendency to break the coal, and make the mass less impervious to ventilation in that region. The captain of the "Oliver Cromwell" told me that his ventilators were perfect in their action, as he frequently examined them and found that a current of air passed through them up the shaft.

I entertain a decided preference for the mode adopted at Birkenhead of loading largely by barrows instead of by tips, as the coal is more carefully handled and it is stowed more gradually over the hold, besides which the labourers employed have the opportunity when shovelling it into the barrows of picking out all objectionable looking pieces, which I believe they do. I have shipped it from Birkenhead at all seasons of the year, and when it has been saturated with rain in the railway trucks, without any detriment except loss of weight on delivery.

I have had no previous experience of coal from the Tyne, never having had ships loaded there before.

I would pointedly call your attention to the close approximation in the number of days from sailing to when the fires occurred, say, "Oliver Cromwell" 80 days and "Calcutta" 77 days.

From Messrs. W. & J. Smith, London.

"Eeta," "Enthusiaste," "Try," "Crystal." (*See* pp. 94-97.)

1. Yes, in two partly owned by ourselves, and two chartered vessels. Our ships were "Crystal" and "Eeta" chartered were "Try" and "Enthusiaste."

3. Our vessels being employed in the sugar trade, have ventilators fore and aft. We know of nothing better for coals, but we do not generally carry full cargoes of coal.

4. Never take full cargo except purchases and charters not under our management; by this we mean in our own ships.

5. Given on separate papers.

6. Six to ten days.

* This report of Captain Stoinson's was read by Mr. Price before the Commission, and will be found in his evidence, Q. 1902.

From Messrs. Agacio & Co., Liverpool.

"Alexandre." (*See* p. 94.)

1. Spontaneous combustion has occurred.
3. See enclosed form.

From Mr. J. E. Burgess, Swansea.

"Admiral Fitzroy." (*See* p. 95.)

1. Yes.
3. When loading smelting coals I generally have the main body of the cargo, say from abaft the mainmast to the foremast, divided by running up deals on either side of hold stanchions from keelson to main deck, leaving it open at the top.
4. About 45 per cent. over N. R. tonnage.
5. Smelting coals through and through as worked from the collieries.
7. Nothing more than as given at No. 3.

From Mr. Thomas Law.

"Dumbartonshire." (*See* p. 95.)

1. No, only in "Dumbartonshire" with 540 tons balance of cargo, general.
3. 'Tween deck beams longitudinal; also keelson ditto; and the three hatches perpendicularly.
4. 50 per cent more.
5. All kinds from Cardiff, Birkenhead, and Clyde.
6. Don't know.
7. We take no precautions except ventilating.
8. No.

From Messrs. Hughes & Co., Menai Bridge.

"Glen Tilt." (*See* p. 96.)

1. Yes, combustion by one ship.
3. Our wooden ships invariably carry platforms open at both ends, and the opening kept clear to main deck ventilators, and our iron vessels are so constructed that they afford ample ventilation.
4. Once and a fourth of the register tonnage.
5. Mostly steam coals.
6. Cannot reply.
7. Ventilation as described above. Answered in the enclosure.

From Messrs. Seed, Armstrong, & Co., Liverpool.

"New Lampedo." (*See* p. 97.)

1. Yes, in one.
3. Platform and deck ventilators.
4. Register and third. Sometimes a little over; varied according to ship I am loading.
6. Cannot say.
7. Caution master to leave hatches off at all times when practicable. Have had nothing but fire engine and hose.

From Mr. D. Stuart.

"Staffordshire," "Monmouthshire." (*See* p. 96.)

1. Spontaneous combustion has occurred twice.
3. The ordinary system wooden ventilators.
4. In the first case the quantity of coals was two thirds of the registered tonnage.

In the second case it was the entire cargo.

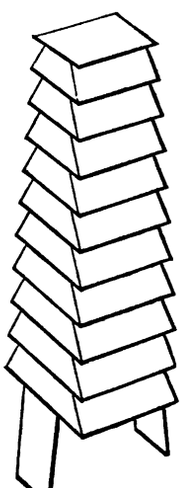
5. Lancashire steam coals. The White Moss Colliery single screened.
6. I do not know, but I fancy immediately.
7. This I have left to the management of the captains.
8. None.

From Messrs. Balfour, Williamson & Co., Liverpool.

"La Escocesa." (*See* p. 97.)

1. Yes.
2. Once in ship "La Escocesa."
3. Fore and aft along keelson, and three vertical ventilators so constructed as to prevent admission of small coals, and at same time grant free exit to gas.

Vertical ventilators constructed as per sketch :—



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4. About 45 per cent. over register tonnage.
5. Lancashire, North and South Wales coals.
"La Escocesa" was loaded in Cardiff with South Wales coals fresh from the pit, and raining heavily while she was loading.
6. Of late years only a very short time before shipment.
7. Hatches off during fine weather at all times. Fire-engine, hose, and buckets always on board.
8. Coal-laden ships should either be ventilated properly or not at all. If only partially ventilated, and heating should take place, the partial ventilation causes them to burn rapidly. If not ventilated at all, they may occasionally be kept smouldering for weeks, and thus give the ship an opportunity of reaching some port.

From Mr. E. Bates.

1. "Euxine" and "The Foundling."
3. Generally a ventilator run fore and aft through the coals, of wood connected with a perpendicular shaft in each hatchway.
4. Varies according to the vessels, "Euxine" 5 to 4. Usually about one third more than the register tonnage.
5. Almost all kinds exported at various times.
6. Unknown.
7. Have never had a case of explosion. Ventilation prevents this; and have never had a case of combustion until last year, 1874, when besides the above known cases we have lost two other coal-laden ships which have not been heard of, and are "missing."

From Mr. D. Kennedy, Liverpool.

1. Yes.
3. Platformed.
4. 25 per cent. to 30 per cent. more than the register tonnage.
5. Different collieries "said" to be double-screened.
6. A few days if loaded in the Mersey, a shorter time if in the Tyne.
7. Ventilators up each hatchway, and orders to have hatches off in fine weather.
8. Quite at a loss what to suggest. For I say (20 at least) found platform of 3-inch deals from mizen mast foremast with ventilators up each hatch sufficient, but lately have had two ships on fire from coal cargo. Think the quality and character of coal changed.

From Messrs. Elliott, Lowrey, and Dunford, Newcastle-on-Tyne.

1. Yes, in the case of the S.S. "Broomhaugh."
3. Since the accident above steamer has been fitted with ventilators in the holds, but generally our masters are instructed to uncover the hatches whenever the weather will permit.
4. Our cargoes average ·87 over the N.R. (this of course includes fire coal).
5. Our steamers have carried nearly all kinds of Welsh and North country steam and gas coals.
6. Our impression generally is that coals are shipped within, say, 12 to 24 hours of being worked.
7. As explained above our captains are instructed to remove hatches in fine weather.
Our ships are furnished with rivetted leather hose of sufficient length to reach all parts, of the ship, besides being provided with a proper complement of water buckets.
8. Apart from explosion on board a coal-laden ship from extraneous causes, as in our case, we are inclined to the idea that too little attention is paid to the shipment of coals in vessels going long voyages.
With reference to ventilation, provided coals are shipped and kept in a dry state we would certainly look upon it as a preventive against spontaneous ignition; but on the other hand, should they be shipped after being exposed to rain, or from wet workings, we fancy ventilation would rather assist combustion than otherwise.

From Messrs. Livingston, Briggs, & Co., 31 Great St. Helen's, London.

1. As owners none. As charterers for the Peninsular and Oriental Company, we believe several have been burnt, but whether by spontaneous combustion or otherwise we are unable to say.
2. These can be better answered by the owners or masters of the vessels.
3. Ventilation is adopted and stipulated for in our charters, but we are unable to state the exact means. This is left to the owners and the Peninsular and Oriental Company's inspectors at the loading ports.
4. About 40 per cent. to 50 per cent. over.
5. All descriptions, namely, Powell's Duffryn, Ocean Merthyr, Letty Shenks, North Wales Main Scotts Brymbo, West Hartley Main Carrs, Davidson's, Howard's, Bower's and Bebside's Hartley.
6. Sometimes the same day, but generally a few days before.
7. This is left entirely to the masters of vessels.
8. Nothing especial, we believe. It is more a question for chemists.

From Mr. C. Thompson Wigram, Blackwall Yard.

1. In one case.
2. The coal was taken direct from the pits into the ship's hold in wet weather at Cardiff, and subsequent bad weather prevented the hatches being kept open at sea.
3. We do not take any special precautions to ventilate the coal bunkers of the steamships in which coal is stowed in bulk to the extent of three or four hundred tons. The coal is never taken direct from the collieries to the ship's hold.
5. Nixon's Navigation, and Hartley's.
6. Ten to fourteen days.
7. No special precautions are taken beyond those adopted for the general protection of the ships from fire.

From Messers H. Fernie & Co., Liverpool.

1. No.
3. System of ventilation explained in accompanying letter.
4. From one fourth to nearly one half in excess of the N.R. tonnage according to the build of the different ships.
5. From Birkenhead and Cardiff the usual diversities of North and South Wales steam coal. From the Tyne, principally the West Hartley.
6. When shipped from Birkenhead we should say from two to three days. From the other parts we believe considerably less time.
7. Having taken such thorough precaution to prevent any fire by ventilation, we have hitherto left the masters to divise any special means of dealing with fire if it did after all arise.
8. We believe that if all coal could be exposed to the influence of the air for two days before shipment the risk of spontaneous combustion would be decreased.

Sir, Liverpool, 27th May 1875.

In reply to your letter of 24th instant we beg to state that in the interval from 1866 to end of 1874 we had despatched 49 large ships fully laden with coals to various ports of India and South America, and that every one of these ships carried their cargoes safely although some of them had the coal on board for fully six months.

During all that period we have followed out the one principle of ventilation, though a little varied, in the wooden and iron ships respectively; and, as our system has been so successful, we have thought it best to send you pen and ink sketches of same, marked No. 1 for iron ships and No. 2 for wooden ships, for your further information.

Besides this ventilation, however, we invariably lay a platform of deals secured by spike nails to bearers laid across the bottom of the ship, and extending from the keelson to the lower part of the bilge in breadth, and extending nearly the whole length of the ship. This platform stands about 16 inches above the ceiling beside the keelson, and runs off to nothing at the bilge, and the lower ends of the upright louvre or venetian ventilators rest on the keelson and platform, through which sufficient air holes are bored in the proper places to allow a continual current of air passing along the ship's bottom all the way from the fore hatch to the after hatch.

We may mention three cases in which we think the value of our mode of ventilation was specially tested.

First, in the case of the ship "Iron Cross," which sailed from Shields to Bombay on 30th November 1872, and having encountered one of the furious gales of that season off Scilly had her decks swept, and put back to Portland with 9 feet of water in her hold, which had come in through the decks and stanchions being injured, and which had passed through the body of coals, thereby rendering them more dangerous for fire. The ship being refitted reached Bombay on the 2th May, which was 5½ months after sailing.

Second, in the case of the "Royal Alexandra," which sailed from Shields for Bombay on the 11th September 1874. This ship by inadvertance was laden 5 inches

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deeper than usual. Her cargo was West Hartley coal (and several ships whose cargoes consisted of that description of coal and sailing very nearly about the same date were burnt), and she made a long passage of 161 days, but her cargo remained perfectly cool and safe until discharged.

Third, in the case of the "Grampian," which sailed from Birkenhead with a cargo of North Wales steam coal on 1st October 1874, and also, as usual at that season of the year, made a very prolonged passage of 158 days, and her cargo was quite cool and safe till discharged.

We may mention that our orders to the captains are very strict, that all the hatches should be off in good weather, so that for a great portion of the voyage in most cases a further and large current of air is brought on the surface of the cargo.

Should it be thought necessary we could have a wooden model made at very little cost showing this plan of ventilation more effectually than by the sketches which accompany this letter.

We are, &c.,

J. M. Carmichael, Esq. HENRY FERNIE & SON.

MEMORANDUM of COAL-LADEN VESSELS.

Sailing Date.	Ship.	Ship's. Registered Tonnage.	Coals. No. of Tons shipped.	From	To
1866.					
November 24	Lady Rowena	1,181	1,688	Cardiff	Rio de Janeiro.
1867.					
July 1	Juventa	1,324	1,744	Do.	Muscat.
1868.					
January 9	Adelaide	1,693	2,074	Birkenhead	Aden.
April 25	Chrysolite	1,097	1,466	Greenock	Port Blair.
September 8	Lancashire Witch	1,574	2,035	Birkenhead	Bombay.
„ 8	Juventa	1,324	1,630	Do.	Do.
1869.					
September 22	Do.	1,324	1,644	Do.	Do.
December 22	Queen of the Mersey	1,227	1,602	Cardiff	Rio de Janeiro.
1870.					
January 29	Adelaide	1,693	2,190	Birkenhead	Aden.
February 26	Lady Rowena	1,181	1,644	Newcastle, N.S.W.	Bombay.
March 18	Chrysolite	1,097	1,455	Cardiff	Singapore.
June 6	Feronia	1,250	1,649	Do.	Aden.
July 7	Vancouver	1,065	1,436	Do.	Singapore.
August 6	Flower of the Forest	937	1,302	Do.	Monte Video.
September 15	Queen of the Mersey	1,227	1,653	Do.	Do.
„ 23	Robert Kerr	1,191	1,640	Birkenhead	Bombay.
November 28	Royal Adelaide	1,385	2,033	Do.	Do.
„ 30	Juventa	1,324	1,600	Do.	Do.
1871.					
February 13	Chrysolite	1,097	1,413	North Shields	Aden.
April 6	Lady Rowena	1,181	1,728	Do.	Bombay.
May 26	Lancashire Witch	1,574	2,000	Do.	Mollendo.
September 16	Feronia	1,250	1,720	Birkenhead	Aden.
October 15	Iron Cross	1,508	1,844	North Shields	Signapore.
„ 25	Waterloo	1,222	1,700	Birkenhead	Bombay.
December 12	Robert Kerr	1,191	1,650	Do.	Signapore.
1872.					
March —	Melpomene	1,439	1,950	Sydney, N.S.W.	San Francisco.
April 27	Timour	1,330	1,600	Sunderland	Aden.
„ 27	Adelaide	1,693	2,029	Birkenhead	Do.
May 11	Chrysolite	1,097	1,415	North Shields	Singapore.
October 7	Lancashire Witch	1,574	2,000	Do.	Mollendo.
„ 7	Royal Alexandra	1,383	1,746	Do.	Bombay.
November 9	Magdala	797	1,030	Cardiff	Monte Video.
„ 30	Iron Cross	1,508	1,704	North Shields	Bombay.
December 11	Robert Kerr	1,191	1,616	Birkenhead	Do.
„ 14	Feronia	1,250	1,624	North Shields	Mollendo.
1873.					
May 15	Vancouver	1,065	1,474	Birkenhead	Point de Galle, Ceylon.
June 24	Lady Rowena	1,181	1,648	North Shields	Do. do.
August 1	Royal Alfred	1,239	1,653	Newcastle, N.S.W.	San Francisco.
„ 28	City of Manchester	1,791	2,496	North Shields	Calcutta.
September 6	Cashmere	1,245	1,866	Do.	Bombay.
October 13	Prospero	1,328	1,977	Birkenhead	Do.
December 21	Adelaide	1,693	2,057	Do.	Aden.
1874.					
May 1	Robert Kerr	1,191	1,652	Do.	Singapore.
„ 27	Melpomene	1,439	1,805	Newcastle, N.S.W.	San Francisco.
June 27	Idomene	1,390	1,824	Sunderland	Do.
July 14	Great Victoria	2,278	2,508	London	Calcutta.
„ 30	Chrysomene	1,777	2,585	Newcastle, N.S.W.	San Francisco.
September 11	Royal Alexandra	1,383	1,794	North Shields	Bombay.
October 1	Grampian	1,492	2,293	Birkenhead	Do.
	Total tons	65,871	86,886	Tons of coal.	

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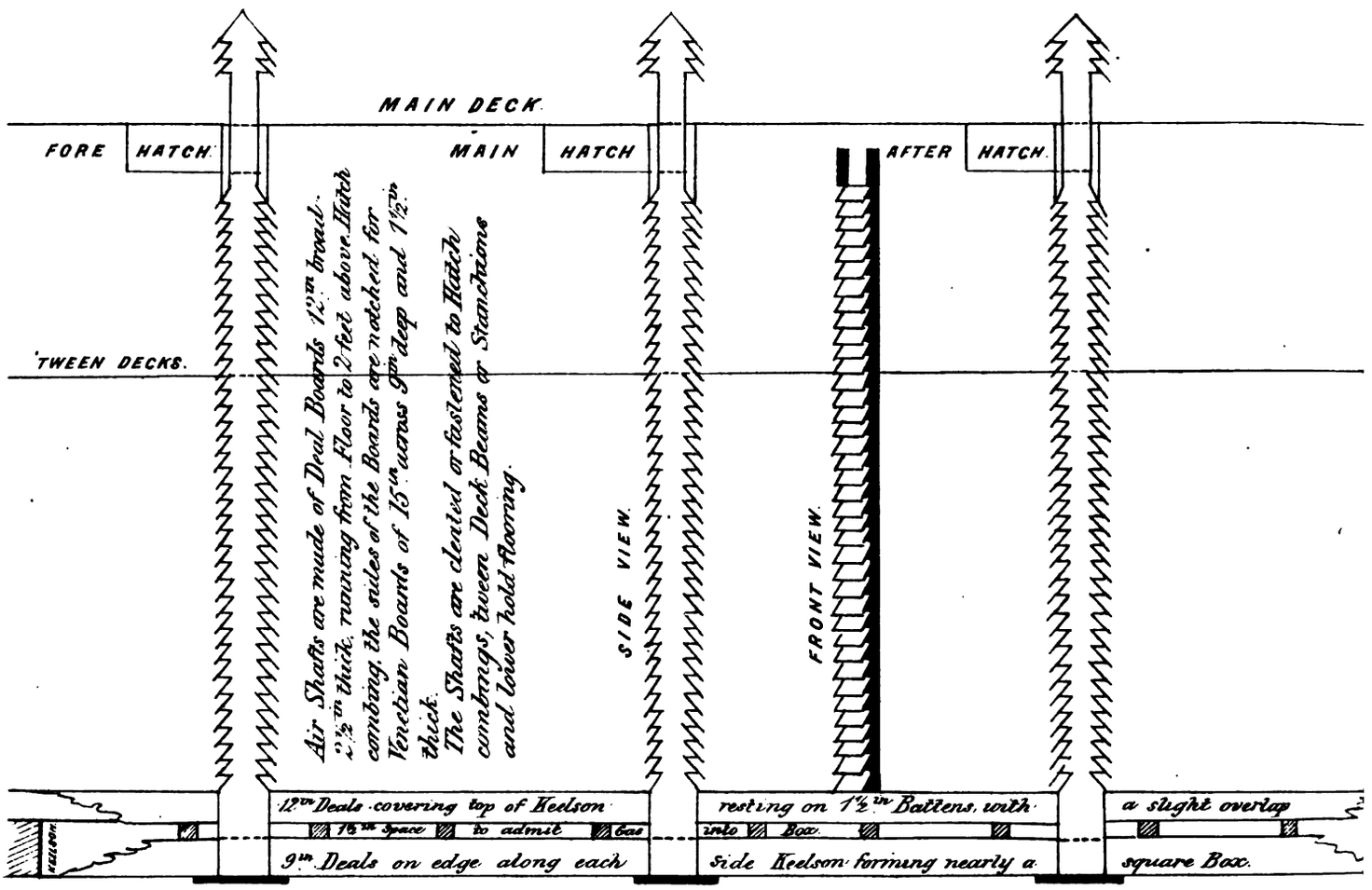
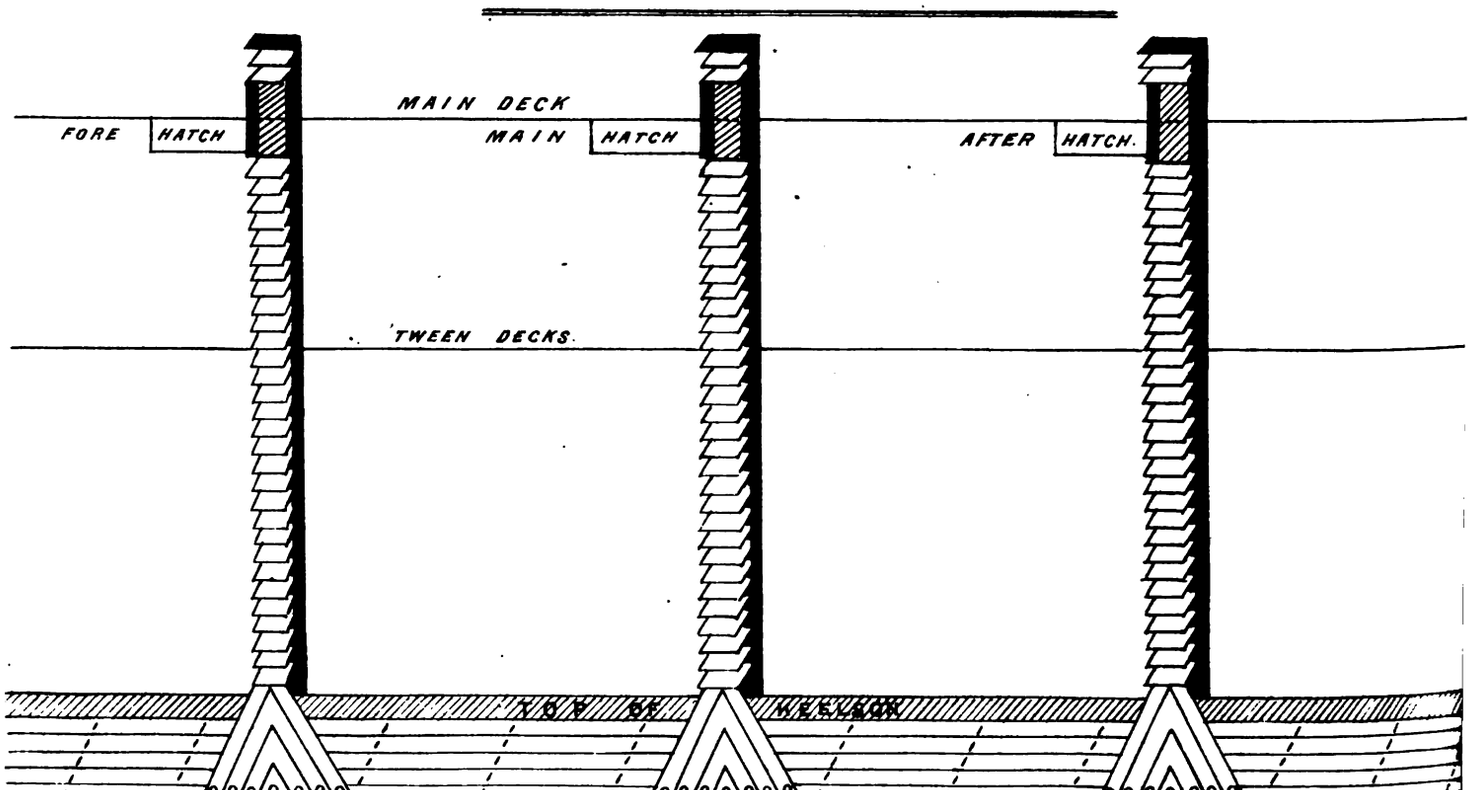
Nº 1.

VENTILATION FOR IRON SHIPS.


MAIN DECK.
FORE HATCH.
MAIN HATCH
AFTER HATCH.
'TWEEN DECKS.
Air Shafts are made of Deal Boards 12in broad. 2½in thick, running from Floor to 2 feet above Hatch combing, the sides of the Boards are notched for Venetian Boards of 15in across 9in deep and 1½in thick.
The Shafts are dealed or fastened to Hatch combings, tween Deck Beams or Stanchions and lower hold flooring.
SIDE VIEW.
FRONT VIEW.
12in Deals covering top of Keelson
15in Space to admit Gas
9in Deals on edge along each
resting on 1½in Battens, with into Box.
side Keelson forming nearly a
a slight overlap
square Box.
KEELSON.

Nº 2.

VENTILATION FOR WOOD SHIPS, *WITH HIGH KEELSONS.*



Fore and aft Battens laid sloping, with small overlap, from 2 feet off bottom of Keelson up to edge of Keelson on pieces Deals notched and forming venetian work, as in above Air Shafts, also large auger holes bored through Limbers & Platform, if any, for escapement of foul air into air shafts.

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2	ships	Cardiff to Rio de Janeiro.
1	„	do. Muscat.
2	„	do. Singapore.
1	„	do. Aden.
3	„	do. Monte Video.
1	„	North Shields to Aden.
5	„	do. Bombay.
3	„	do. Mollendo.
2	„	do. Singapore.
1	„	do. Point de Galle.
1	„	do. Calcutta.
5	„	Birkenhead to Aden.
10	„	do. Bombay.
2	„	do. Singapore.
1	„	do. Point de Galle.
1	„	Newcastle, N.S.W., to Bombay.
3	„	do. San Francisco.
1	„	Sunderland to Aden.
1	„	do. San Francisco.
1	„	Greenock to Port Blair.
1	„	Sydney, N.S.W., to San Francisco.
1	„	London to Calcutta.
49	Total number of coal-laden ships.	

From Mr. E. T. Gourley.

1. None.
3. Wooden longitudinal spouts with upright shafts.
4. This varies in accordance with the voyage.
5. Every description.
6. This depends upon the coal demand. When the demand is slack colliery owners pile their heaps, and ship them off when trade is brisk.
7. Board of Trade fire engine and hose regulations.
8. That all coal-laden ships for long voyages be fitted with bildge fore and aft, and upright air shafts of wood or metal.

From Mr. H. E. P. Adamson, North Shields.

1. No.
3. The steamers are ventilated in each hold. The 'tween deck ventilators being venetians with the usual cowls on the upper deck.
4. It depends on the quantity of bunker coals we take on board of our steamers.
5. All descriptions of Northumberland and Durham coals, and some descriptions of Welsh coals.
6. From 12 to 24 hours.
7. The sailing ships we have are engaged in the Mediterranean trades, and are ventilated daily from or through the hatches. The steamers go to India, America, the Mediterranean, and the Baltic.
8. No.

From Mr. John S. De Wolfe, Liverpool.

1 No.
3. Venetian wood ventilators in each hatch, let into fore-and-aft ventilators on each side of the keelson; also in lower hold ventilators from side of ship into up-and-down ventilators; iron masts, pump well, and chain lockers also constructed to act as ventilators,
4. Depends upon the model, &c. of the vessel. Refer to list attached of vessels loaded. Don't take register tonnage into account.
5. Names of collieries unknown. Believe coals generally double screened. Always so when purchased on our own account.
6. Unknown, but we believe generally shipped immediately.
7. Instruct captains to keep off their hatches in fine weather. Supply the vessels with fire engines.

From Mr. J. R. Hawley, Liverpool.

1. No.
3. Wooden passages with upright shoots.
4. Tonnage and third.
5. North Wales and Lancashire steam coals single screened, and cargoes from Newcastle, N. S. Wales, to India, and China.
6. A week to ten days.
7. I have arranged ventilators or passages made and composed of substantial timber planking, open at corners placed and running on each side of the keelsons, similar passages placed 6 to 8 feet up in the body of the coals or fuel along the bildges. All my ships have 'tween decks laid, and I cause similar passages to be carried on each side thereof in the body of the fuel.

The passages all communicate with upright shafts through each and every hatchway, and made of sufficient size to admit a big lad to go down these shafts for inspection. These are kept open in all weathers, but in case of its being very bad have venetian caps to lift on and off.

The cargo is trimmed well up to the decks in the centre of the vessel, keeping a clear space at both ends the which having grating communications also act as ventilators through lower forecastle and lazarettes. Masts when of iron are bored, and are air conductors of great merit. Should fire occur each vessel carries two very powerful force pumps. Fire engines kept ready for use at all times. I carry lightning conductors to each masthead; these have saved the vessels very frequently when struck.

8. No vessel should go to sea without sufficient lightning conductors.

My vessels being high-classed wooden and composite ships engaged in the Indian and China trades, and carrying large and very valuable cargoes, both on my own and general account, ventilation has at all times had my most particular attention, and is essential to safety both to ship and cargo, and is too little attended to.

I never allowed coals to be shipped in wet weather, and I think this is a point that should call for strict attention, particularly so in large and bulky cargoes.

Having run very many times uninsured on my ships and cargoes I was naturally very careful on all their equipment. I consider ships are too lightly manned, and the class of seamen are very deteriorated of late years. I should mention that in 1872 I lost a ship, the "Sea Pink," classed at Lloyd's, just out of graving dock after caulking and re-coppering. She took on board a cargo of coals at Shields for my own account and sailed for Calcutta. Ventilated as noted. She passed the Downs after bad weather, from where I had letters from Captain McKenzie, an old tried servant, stating everything satisfactory, cargo perfectly cool, and little or no difference in the atmosphere of the hold. I have never since heard of him or any of her crew.

I do not attribute her loss in my own mind to fire. My impression is that she was lost in very bad weather off the Cape of Good Hope, in which being afloat she would likely be caught, and Lloyd's list reported a vessel sighted after apparent collision or accident in great distress, the description answering to the paint and of the said vessel. I tried perforated iron ventilators on two or three occasions (Meacock's patent), found the weight of material too great for them to bear, and the iron pipes collapsing practically it was useless.

From Messrs. Adamson and Ronaldson, London.

1. No.
3. If platformed, shafts to same with venetian sides; otherwise dunnage laid each side keelson fore and aft, with shafts as above through each hatchway, besides the ventilation arrangements on the upper deck. Instructions given to officers to keep the hatches off at all times as long as possible, but not to allow the cargo to get wet.
4. About one third over, sometimes a little more, sometimes a little less, according to the dead weight capacity of the ships, which of course vary.

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5. Steam coal, gas coal, and patent fuel. We can hardly specify the collieries, but should say from most of the leading ones of Tyne, Cardiff, and Birkenhead. Almost always double-screened, but from what "seam" never comes under our notice.

6. This we cannot say. Shippers only could give this information.

7. Replied to under No. 3. All our ships are supplied with good fire engines, hose, and buckets.

8. We consider if the above precautions are adopted, and the cargo not put into the ship for 24 hours after being in the trucks, there should be little danger. Also that small coal or dust should not be allowed to accumulate in large quantities in the hatchways under the cargo. It stops ventilation, and, if damp, is liable to heat by pressure of the coal above.

From Messrs. H. N. Hughes and Stephen, London.

1. None to our knowledge over a period of say 25 years, during this time having been very heavy shippers.

2. See above.

3. We ventilate our ships as recommended by the Salvage Association Surveyors in slip 221.

4. Large spruce ships carry from 40 to 50 per cent. in excess of registered tonnage on draughts approved of by surveyors. Other wooden ships about 30 to 40 per cent. more than their register tonnage. Iron ships vary very much in their carrying. The best carriers take nearly the same proportion as spruce ships.

5. We ship only North Wales main seam coal from collieries on the list of the Great Indian Peninsular Railway Company, which has been inspected and tested by the consulting engineer of that company. All the coal according to agreement is double-screened, and pyrites are carefully picked out at the collieries.

6. We believe 24 hours is the shortest interval between raising coal from the pits in North Wales and shipment of same at Birkenhead.

7. We consider careful ventilation, as explained in the Salvage Association slip 221, also care in picking out pyrites, both at the collieries and again alongside ships on shipment, and the loading of ships by handbarrows instead of tips, to be the best precautionary measures against spontaneous combustion.

From Mr. James de Wolf, Liverpool.

1. No.

3. A ventilator alongside of the keelson fore and aft each side, and a ventilator from the keelson to main deck in the fore, main, and after hatches.

4. About 50 per cent. above register tonnage; sometimes more, according to the build of the ship, voyage, and season.

5. All kinds of coal double-screened as far as I know.

6. I do not know.

7. I take no other measures than those mentioned herein. I have never had an accident during 30 years' experience.

8. I consider coal taken directly from the pit and put on board ship more likely to ignite than coal remaining on the bank some time before shipment. I disapprove of too much ventilation.

From Messrs. Leitch and Muir, Greenock.

1. No.

3. Wooden ventilators along both sides of keelson and below 'tween deck beams connecting with upright wooden sparred ventilators in each hatchway. Hatches kept open at all times when state of weather admits of this being done.

4. Very nearly tonnage and half.

5. Lancashire Welsh, and Scotch steam. Cannot give the names of collieries. Coal is usually double-screened for shipment to India. The shipments have been made at Birkenhead, Cardiff, and Clyde.

6. Cannot say, but believe in most of the cases it came direct from the pits to the ships.

7. Beyond keeping the hatches open and watching the temperature of the hold, as shown in the state of the air in the ventilators, do nothing else; fire engine and head pumps, with hose for throwing water on the cargo.

8. Suggest fitting shifting boards fore and aft along both sides of hold, stanchions carried up to close beneath the deck, or piling stowwood alongside of the hold stanchions at various parts of the ship.

From Mr. W. O. Taylor, Dundee.

1. Out of nearly 40 cargoes British, and some half-score Australian coal shipped for the East and West Indies, and East and West Coast, South America, I have not had one case of spontaneous combustion or explosion.

N.B. All vessels carrying the above have been under 1,000 tons register.

3. Simply keeping the hatches open when practicable, being of opinion that all other methods have a tendency the opposite of that desired.

4. In most cases say full deadweight capacity.

5. Chiefly steam coal from various collieries, shipped in Wales, the rivers Tyne, Mersey, Clyde, Forth, &c.

6. Different periods, according to the demand and convenience of the sellers, but prefer coals to have been worked some time previous to shipment.

7. None beyond seeing that the coals are shipped in as dry a state as possible, and having proper attention given to the ventilation as above.

8. I am decidedly of opinion that ventilation by wooden ventilators tends to spontaneous combustion, and I believe the first coal-laden vessel that caught fire in this way (the "Humayoon") sailing from Dundee, was the first to adopt the new method of ventilation, say by introducing wooden ventilators amongst the coals.

From Messrs. Edward Shotton & Co., North Shields.

1. Nothing to speak of. In one case many years ago a vessel's keelson was partially burnt. I think she was loaded at Birkenhead. Water was pumped into the vessel and the fire extinguished. This occurred at Point-de-Galle. This is the only case happened to any of our vessels.

3. Ordinary ventilating shaft communicating with each hatch, thus—

4. About one half more; in summer time a little more.

5. Generally steam, but sometimes gas.

6. Generally about two days.

7. A current of air is passed from the fore to the aft hatch by means of shafts. Fire hoses.

8. No hatches should be battened down for some hours after the vessel is laden. Length of time depending on description of coals shipped. Fore-and-aft hatches we have built 2½ to 3 feet high, so that at almost all times excepting when the sea is very heavy they can be open,

This we have practised for from 20 to 30 years, and to this we mainly attribute our escape from the risks above alluded to, for the gas has no means of collecting in sufficient quantity to do damage.

From Messrs. Stuart and Douglas, Liverpool.

1. No.

3. A ventilating shaft, 24 in. by 16 in., constructed of boards with a sufficient space between the boards on each side of the shaft to allow of any gas that may be thrown off by the coal to pass through these gaps into the ventilating shaft, and so be conveyed at once to the outer air, also a chamber of boards enclosing the keelson of the ship from end to end. The shafts above described are fixed into this chamber; one shaft is placed in each hatchway, and the shafts project 4 feet above the top of hatch.

4. Generally about 1⅓. The average of 25 coal cargoes gives 1·225.

5. We have shipped Bower's West Hartley coal from the Tyne, Wigan coal under charter from Liverpool, and North Wales steam coal from Birkenhead. We cannot give the names of the collieries. We believe the coal has in all cases been well screened.

6. The last cargo from the Tyne (and which has arrived safely at its destination) was shipped in about an hour after leaving the pit. The coal shipped at Birkenhead has, we believe, been not less than two days out of the pit before being shipped.

7. Copious ventilation as above shown and having the hatches opened during the voyage as often as practicable, and regular attention to the ship's permanent moveable headed ventilators. For extinguishing fire the ship is provided with fire engine and hose, and set of fire buckets; but we rely mainly upon preventive measures.

8. We have to remark that we attach great importance to the way in which the ventilators are fitted in the ship. We always employ our own carpenters, and spare no expense to have the work done substantially. From the careless way we have seen this kind of work done, we are quite sure it would give way with the pressure of the cargo, thus effectually breaking the current of ventilation, and probably ending in the ignition of the pent-up gas.

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From Messrs. ABRAM LYLE AND SONS, Greenock.

1. None.
3. Vertical wooden ventilators in each hatch, and fore-and-aft ditto along keelson.
4. About tonnage and third, varying a little according to circumstances.
5. Principally Wishaw coal, say Watson's, Hartley, and Spencer's splint, double-screened; seams unknown to us.
6. Latterly we understand a very short time, perhaps about a week.
7. We rely chiefly on our strict injunctions to the captains to have the hatches off on every possible opportunity; but if fire should take place, the instructions are to flood the ship by means of a fire engine, and at the same time to keep throwing overboard the coal until the fire is overcome.
8. We think if large stringly-sparred ventilators (vertical), sufficient to let a man easily down, were put in each hatch, they should both give better ventilation than the small ones now in use, and would also, in the event of fire, let a man down to the very bottom of the coal with a hose. A more systematic style of stowing might also do good.

From Mr. G. A. CAWS, Northumberland.

1. No.
3. No regular system, only hatchway and deck ventilators.
4. Nearly double.
5. Newcastle, Cardiff, and coals of all descriptions, both double and single screened, and unscreened.
6. A day or two.
7. For long voyages, ventilation through deck and hatches, taking care that the squares of the hatchway are kept clear of coal, and not filled up so as to prevent the escape of gases.
8. For long voyages the coal should be shipped dry and as clear of brasses as possible. Lower deck hatches should be kept off, and the upper deck hatchways kept clear of coal, with ventilators through the decks and hatches to allow a current of air to pass over the top only and prevent the accumulation of gas; cocks to admit water in case of need. Coal ships are seldom properly dunnaged, and the same care is not taken (as with perishable cargoes) to keep the vessel always pumped dry, the water being thus sometimes allowed to get above the ceiling; this would be dangerous with small coal, which would be apt to heat.

From Messrs. SMITH, BILBROUGH, & Co., London.

1. No.
2. We build a wooden platform rising from 12 to 18 inches above the skin of the ship at the keelson, and 18 to 24 inches above the skin at the bilges, opening at the ends with two small compartments free of cargo, and communicating with two ventilators through the deck. We also have ventilating ladder shafts through each hatch.
4. From one third to one half above, according to the ship's carrying powers.
5. Principally steam coal from South Wales, Newcastle, and Liverpool; also from Newcastle, N.S.W.

We cannot name the collieries as we do not know them; the coals were sometimes double and sometimes single screened.

6. We have no means of telling.
7. We keep the hatches open whenever possible, and we provide all our ships with two fire-engines, one fixed, the other portable. Some of our larger ships have steam engines with which the fire hose can be connected.
8. We consider the principal causes of fire in coal-laden ships are—
   1. The coal is frequently shipped in a wet state. The small coal, which retains the moisture longest, accumulates at the loading hatch. In then gets heated in time, and finally ignites.
   2. The same thing happens unless the coal is raised by a platform well out of the reach of the bilge water.

We find that our wooden ships have taken about 45,000 tons of coals in the last four years. We have not carried any in our iron ships.

From Mr. GEORGE ADAM, Greenock.

1. None.
3. Along the keelson and in the three hatches; and some of the iron ships have six ventilating mooring bitts on each side,
4. About one third more than the registered tonnage of the ship.
5. Principally Brymbo Welsh, Hartley steam coal shipped at Birkenhead, and a few cargoes Glasgow steam coal, but I do not know the name of the collieries.
6. Cannot say as the coals are shipped by the charterers
7. Keep the hatches off in fine weather during the voyage, and in carrying to India upwards of 40 cargoes never had any case of fire on board of any of our ships.
8. No suggestion to make further than we have been fortunate with our system of ventilation, which some parties now repudiate; at the same time would recommend that coals should not be shipped without being exposed to the air for a reasonable time after being dug from the pit.

From Messrs. EYRE, EVANS, & Co., Liverpool.

1. No.
3. Two shafts fore and aft communicating with shafts up each hatchway, and hatches taken off in fine weather.
4. Generally one third over registered tonnage.
5. All kinds, Glasgow, Dundee, Tyne, Cardiff, Newport, Birkenhead, and Leith, Wishaw, Powell Duffryn, &c.
6. Latterly, say for two or three years, coals have come direct from pit to port of shipment, and have been more liable to heat.
7. Positive orders to masters to examine ventilation closely, seeing there is no heating in the hold, and that temperature in hold is not greater than on deck. We have fire engines and hose always on board, but never required to use them.
8. We believe if masters were particular and coals shipped in a fair dry condition, there would be little risk of fire from spontaneous combustion.

From Mr. W. TURNER, Greenock.

1. Never.
3. Trunks in the hatchway to the keelson.
4. About tonnage and third.
5. Shipped coals at Newcastle, Greenock, Birkenhead, and Cardiff.
6. Cannot tell.
7. See No. 3, with this exception, if the masts are iron they also act as ventilators.
8. The last cargo shipped here on board new iron ship "Rossdhu" for Calcutta *were very wet*, and yet no spontaneous combustion or explosion occurred.

From Mr. JOSEPH ROBINSON, North Shields.

1. No.
3. None, excepting keeping the fore-and-aft hatches open until the ship gets to sea, and in fine weather when at sea, which allows the gas to pass off.
4. Register tonnage and three fifths.
5. Both gas and steam (see general remarks).
6. I think two or three days.
7. None, excepting as referred to in question 3 (as above). No provision against fire made in the sailing ships, steamers have the usual fire hose.
8. Yes; I would strongly recommend that all coals intended for long voyages, should be covered with tarpaulins in transit from the collieries to the ship, and should only be shipped in dry weather, and as a further precaution ships might be dunnaged. My ship "Gladiolus" has been three voyages to the River Plate, and in each case the cargo was on board about four months. Two of the voyages she had Nixon's steam navigation coal, Cardiff double screened, and on the other she had Scotch coal from Glasgow (no particulars of colliery).

The "Eleanor Grace" has just made a voyage out to River Plate, and has had her cargo in four months, and nothing wrong. It was Nixon's steam navigation and double-screened. She had very bad weather going out Our steamers are principally employed in Mediterranean, and sometimes to India. All the ventilation they have is, from the top of the cargo, the ventilators being fitted on the upper deck only.

From Messrs. J. AND A. ROXBURGH, Glasgow.

1. No.
3. In North American trade, and from Newcastle, New South Wales, to California or India, have ventilated the cargo only from the hatches. From Britain on long voyages have used moderately-sized ventilating trunks placed longitudinally, and vertically constructed, so as to admit the vapour arising from the coal. Sometimes vertical trunks only,
4. From 20 per cent. under to 50 per cent. over the net register tonnage, according to the build of the ship, the voyage, the season, and the prospect of a profitable return for carrying the coal.
5. From Clydesdale pits; Davison's West Hartley steam coal.
6. Generally fresh from the pit.

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7. Ventilation as above, and instructions to captain to keep the hatches off in fine weather.
8. Ventilation as far as it provides for the escape of foul air is good, but we think it has been overdone in some instances, and that the current of air introduced into the hold may have been the immediate cause of ignition.

From Messrs. WILLIAM AND ALFRED BROWN & Co., Glasgow.

1. No.
3. In addition to the ordinary deck ventilation we have from three to five shafts, each about 2¼ feet square, latticed on two sides. These shafts run from the keelson to about 3 feet above the deck. A fore-and-aft current is also obtained by laying stout slabs along the keelson. Wind-sails are set on the forward or after shaft according to direction of wind.
4. From 20 to 50 per cent. in excess of net register tonnage.
5. Chiefly steam coal, double-screened when shipped at English or Welsh ports. Cannot say as to screening in Clyde. Cannot name collieries.
6. Generally understood to be fresh wrought.
7. Thermometric observations daily to ascertain whether heat is being generated in the hold (a copy of results recently received is attached hereto). Means for dealing with fire are confined to force pumps, of which in large ships we have three. In the event of heat increasing greatly in the hold, very frequent observations are to be made with the thermometers, and the master is instructed personally to descend the shafts and endeavour to ascertain the condition of the cargo. Should it appear probable that combustion has commenced or is likely to break out, the force-pumps are to be rigged and the coals deluged with water, the steam-winch keeping the ship free by means of the main and bilge pumps. Should this not check combustion, cargo is to be jettisoned so as to give buoyancy for a more thorough flooding of the hold, and the ship is (if possible) to bear up for a port and there be scuttled.

From Messrs. T. DAVIES & Co., Swansea.

1. No.
3. Upright clinker-built ventilators in two hatchways, sometimes horizontal under the beams.
4. From one third to one half above the register tonnage.
5. Bituminous coal for smelting purposes.
6. Generally fresh wrought.
7. Nothing except ventilation, but I attach no importance to ventilation.
8. If the coal is clean, free from dirt, sulphur, and iron pyrites, it will carry even if shipped in wet weather; if not, even if shipped in dry weather, it will probably heat.

From Messrs. J. MORRISON AND SON, North Shields.

1. No.
3. Hatches kept open frequently.
5. Steam coals double screened.
6. Probably two or three weeks.
7. Only adequate ventilation.
8. Yes. The present system of ventilation is bad; vessels should have high comming and main hatches taken off whenever weather permits. Always order my captains to take off the hatches whenever the weather permits. Had vessels to India and other distant trades, but never had fire on board any of them.

From Messrs. THOMAS SKINNER & Co.

1. Never.
3. We have a considerable number of iron ventilators from the deck, and in some cases have carried a wooden trunk along the bottom, connecting it with upright ventilators to the deck in others. We had no ventilation through the coals at all, and all went safe.
4. Register and one third.
5. Both Cardiff and West Hartley.
6. So far as we know only a few days.
7. None except as described in third paragraph. Fire engine.
8. None, as ships and steamers have just gone as safely that had none but deck ventilators as those ventilated through the whole cargo.

B. MASTERS.

UPWARDS OF 100 OF THE FOLLOWING PAPER OF QUESTIONS WERE ISSUED TO MASTERS OF VESSELS EMPLOYED IN THE COAL TRADE.

QUESTIONS TO MASTERS.

1. Has spontaneous combustion, or explosion, ever occurred in any coal-laden vessel under your command?
2. If so, state all the circumstances of each case, as fully as you can, on one of the inclosed forms.
3. Do the owners, or others interested in the safety of the ship or cargo, generally give you any special directions for providing against spontaneous combustion or explosion, or for dealing with fire from these causes should it occur? If so, state them, noting any distinctions in them for fine or stormy weather.
4. In the absence of any instructions, what system of ventilation, if any, do you adopt in the holds of coal-laden vessels under your command? State at the same time the materials of which the ships to which you refer are constructed.
5. Is the ventilation constant, or, if not, at what intervals, and under what circumstances?
6. Is it customary to fill the hold completely up to the square of the hatchways, or to allow a space to remain between the surface of the cargo and the deck beams?
7. Do you test the temperature of the hold during the voyage, and, if so, how, and how often?
8. What means or appliances are usually at your command on board for testing temperature?
9. Does your experience lead you to the opinion that coal has a tendency to "heat" in the tropics?
10. What precautionary rules against explosion do you lay down as to the use of lights?
11. What kinds of coal have you generally carried? State whether small or lump, the names of the collieries, which seams, and whether double or single screened.
12. Are there any special kinds of coal exported that you have found to be more liable to spontaneous combustion than others? If so, describe them.
13. What do you gather to be the general impression among shipmasters as to the provisions made on board coal-carrying ships for the prevention of spontaneous combustion or explosion?
14. Have you any remarks to make, or suggestions to offer, to the Commission on the subject of their inquiry?

Please write "*Confidential*" against any of your answers that you desire to be so treated.

The following are some of the REPLIES received to these QUESTIONS.

From Captain P. T. VAN OVERKLIFT.

"Anna of Rotterdam." (*See* p. 93.)

1. Yes; "Anna," of Rotterdam, 969 tons register. My ship was twice in danger from sp ontaneous combustion of a coal cargo.
3. Nothing further than that I must ventilate the cargo as ordered by the surveyor for French Lloyds. I received a certificate that the cargo was properly ventilated.
4. Sometimes I have not ventilated, but lately I put wooden pipes in the hatchways; last voyage I had in addition wooden pipes along the keelson.
5. Always acting.
6. Lower hold completely filled except forward and aft. The 'tween decks were only partly filled, a space of two feet being left all over the coals up to the deck.
7. Yes, frequently during the voyage, sometimes twice a day.
8. By thermometer, but unfortunately it would only indicate as high as 110° Fahrenheit.
9. No, or but very slightly.
10. I use a miner's safety lamp, also wind sails to remove the gas emitted by the coal.
11. Always steam coals from Newcastle or Cardiff, once patent fuel from Cardiff.
12. I do not know.

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13. Captains are most afraid of explosions, they have usually great faith in the efficacy of pipes in the cargo.

14. All depends on the quality of the coal. I would suggest that coal liable to ignite spontaneously should not be exported for long voyages.

From Captain JAMES FINLAY.

"Alfred of Belfast." (See p. 85.)

1. Neither has happened in any vessel I have commanded. Spontaneous combustion occurred on board a ship in which I was chief officer.

3. Messrs. I. and T. Sinclair of Belfast and W. P. Sinclair & Co. Liverpool, owners of the ships I have sailed in as master from 1852 to 1872, take care to have their ships well ventilated with air shafts through the coals whilst loading, and instruct the masters to keep the hatches open at all times during the voyage when safe to do so. Their ships generally took coals to the East Indies on the outward voyage, and there never was a case of spontaneous combustion known.

4. Their ships constructed some of wood and some of iron.

5. Constant unless in bad weather, when the hatches had to be put on, then we generally managed to have some deck ventilation open.

6. A space is generally left under the beams, no ship could carry the hold quite full of coals.

7. No, unless by personal feeling; I generally visited the hold once every day. Officers were often in the hold when on duty.

8. Common thermometer, of which there are generally one or two on board every ship.

9. I have found steam arise from the coal in the tropics, I think from the increased temperature of the atmosphere.

10. I had the lamps closed and locked before being taken into the hold, as a preventative against fire.

11. Both large and small mixed. Most of the cargoes I have taken from Birkenhead, Brymbo and Welsh Hartley coals; one cargo shipped there was brought from Merthyr, South Wales. I have also taken three large cargoes from Sunderland to the East Indies, all Londonderry West Hartley coal.

12. The Merthyr South Wales coals were the most *suspicious-looking* cargo I ever had from Birkenhead to Singapore, four months passage, in 1869, but kept cool all the way.

13. All I have consulted agree with me that if the coals are shipped in a dry state and ventilated on board, and the hatches kept open at sea, there is little danger of spontaneous combustion.

14. Captain W. Pirie, of 12, North John Street, Liverpool, who has been overlooker for the ships I have sailed, and others belonging to the same owners, could give information on this subject and the names of the collieries from whence the ships were loaded.

From Captain F. G. FRY, Liverpool.

"Admiral Lyons," "Glenlyon," "Hannah Law." (See p. 86.)

1. Yes.

3. The owners of the ships I have commanded always gave particular instructions to give free ventilation to the cargo by keeping off the hatches when practicable, and during stormy weather to keep the shafts up each hatchway open. The free use of windsails and a careful register of the temperature of the hold by using the thermometer each day at noon, lowering it down the shafting of each hatch to determine the temperature of each portion of the cargo.

4. By keeping off all hatches during fine weather and keeping open all ventilation possible during stormy. Constructed of wood of the pine species.

5. Yes, when a shaft is used at each hatch and sufficiently high above the deck to be kept open during stormy weather, and fitted with a cowl on the top to keep out rain.

6. It is customary to fill the ship up to the deck in the middle section in order to keep the centre of gravity high up to make the ship easy, but after a few days at sea the cargo settles sufficient to make a clear space between cargo and deck beams. Hatchways are mostly filled up to the square when a ship has finished, but usually trimmed down afterwards for purpose of ventilation.

7. Yes; each day at noon down each shaft in the hatches.

8. Copper-framed thermometers protected by wire.

9. Yes; more especially in calm weather when there is but little motion, or wet weather when the hatches have to be kept on.

10. By using the safety lantern.

11. Howard's West Hartley, Westminster, Brymbo steam, Laird's Welsh Hartley, Powell, Duffyrn steam, Aberdare steam, all double screened and moderately lumpy.

12. Howard's West Hartley steam and Westminster Brymbo steam more dangerous if shipped newly wrought or wet with rain.

13. That they would like to have the means to admit a large body of water into the hold in case of fire or be provided with an apparatus to inject a gas into the hold to extinguish fire.

14. Yes, to advocate the adoption of a sea valve to admit water in such a volume that it would speedily flood the hold in case of fire, also the loading of coals by hand in lieu of the tips. The providing of every ship with a fire extinguisher and means to inject an extinguishing gas into the hold in sufficient quantity to permeate the whole cargo.

From Captain WILLIAM BUCHANAN.

"Royal Family." (See p. 87.)

1. No; in one instance the coals became very much heated.

3. The owners gave me no special instructions, as they approved of my method, but usually enjoined caution.

4. I usually laid a strong platform, planks nailed roughly close together, fore and aft the hold to about 10 feet from each end, where I placed ventilators. Between fore and main masts I placed a jelesie ventilator athwart ship leading into lower air ports, with an upright ventilator of same description amidship leading up to main deck. The ships to which I refer were two and three decked ones constructed of wood.

5. Ventilation constant.

6. Always filled full up amidships and left any space in the ends.

7. About once a week tested by driving down iron rods in each hatchway.

8. Carried bars of iron for the purpose.

9. Yes.

10. Always used closed-in lights under deck (with any cargo).

11. Welsh steam coal. Names of colleries unknown, shipped from Cardiff and Birkenhead, single screened.

13. That the open-ended ventilators in hatches are not only much crushed in loading, but are, in the event of ship encountering heavy weather, channels for the entrance of water, which in my opinion is the primary cause of all spontaneous combusion of coals.

14. In large vessels I would recommend the open-ended platform; in small vessels iron bell-mouthed ventilators fixed on deck near the hatchways to carry off the foul air and gas.

From Captain G. SYMONS, Swansea.

"Serena." (See p. 89.)

1. Yes.

3. No special directions are given, but masters are left to their own discretion.

4. The cargo is separated in three or four compartments by platform and double longitudinal deals on their edges fore and aft each side of stanchions the whole length of hold.

5. Constant.

6. According to the weight of coal, in some cases the hold is chock full.

7. Yes, as often as possible in fine weather.

8. Thermometer.

9. Yes.

10. Carrying lights in lanterns.

11. Smelting coal, generally small unscreened.

12. The largest proportion of coal sent to Chili is smelting coal; out of 24 voyages to Chili I have carried smelting coal 23 times.

13. Shipmasters differ very much with regard to this question.

14. In my opinion smelting coal should be stowed in as many separate compartments as possible.

From Captain J. GALLOWAY.

"Malabar." (See p. 89.)

1. Yes.

2. Have done so.

3. Nothing further than to see the ventilators carefully put in and to keep hatches off whenever weather would permit.

4. Have replied to this in statement as to the "Malabar."

5. Constant.

6. Necessarily there is a space between top of cargo and the deck beams, as no ship can carry herself full to the square of the hatchways.

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7. On some voyages not at all, and on others daily.
8. An ordinary thermometer.
9. No.
10. None.
11. Generally called steam coal, both Scotch and English, the former Watsons; Hartley and latter.
12. Cannot specify as to this question.
13. Have never heard any captains complain of insufficient means or provisions, so far as known, being on board.
14. Never to allow coals to be loaded in a wet condition.

From Captain Wm. Kennedy.

"L'Agouhanna." (*See* p. 89.)

1. Yes; once.
3. None.
4. Lay ventilators alongside keelson on both sides, also down each hatch, each one entering into fore and aft ventilators in ship's bottom, each hatch ventilator being 2 feet above coomings; then 6 feet above keelson ventilators place two ventilators (16 inches square) fore and aft, the ends in peak clear of coal; 18 inches under beams place two ventilators right fore and aft, ends clear in the peak; thwartship ventilators into each of the fore and aft ventilators at each hatch entering into upright ventilators.
5. Constant.
6. The coal from fore part of after hatch to about 13 feet before fore part of main hatch, 2 feet from lower part of deck beams, tapering in each end to about 5 feet from lower part of deck beam.
7. Once a week, by a thermometer being lowered down upright ventilator.
8. Thermometer.
9. Find more heat in wake of hatchways in from 30° to 40° W., or ditto south, than in tropics.
10. None allowed below decks.
11. North Wales and Cardiff coals.
12. Cannot say.
13. Consider ventilation best preventative, but should fire occur I believe ventilators assist the burning; in 1872 loaded 1,900 tons coal in Glasgow, "Loconada;" no ventilators and no signs of heating. Consider coal should not be shipped during wet weather.

From Captain C. S. Caird, Greenock.

"Arracan." (*See* p. 92.)

1. Yes.
3. I have been left to my own judgment from my owners; always advised not to ventilate by the coal shippers in the Tyne.
4. "Arabia," three upright ventilators. The fore hatch one was burned 3 feet at foot when discharged at Bombay; no other fire. Coals very hot in the hatches among the small in several vessels. I have found this small coal to be almost unbearable discharging with and without ventilators.
6. It is advisable to fill a ship amidships up to the deck beams, leave all open space in the ends for to ease the vessel.
7. Only by going below and feeling above blood heat, especially forward, three times a week.
8. Thermometer.
9 Yes.
10. Never seen nor never used any.
11. Steam coal:—Tyne, Sunderland, Swansea, Cardiff, and Birkenhead loaded?
12. Can't say as all small coals are liable if damp even in bunkers and smiths' heaps.
13. Careless in loading and coals getting wet, trimmers not cautious in protecting ventilation and dividing coal big and small?
14. Have never seen any care taken to keep coal dry while loading in the north or Cardiff. Inspectors are much wanted to look after ventilation and stowage.

From Captain John Frostick.

"John," (*See* p. 96.)

1. Yes.
5. Constant.
8. None.
9. No.
11. Abbw coal.
12. Some of the South Wales smelting coal are more iable than others.
14. In my opinion coal cargoes when bound on long voyages ought to be shipped dry, and laid upon a platform, say 6 inches high, with an up and down ventilator at each end, which would cause a strong draught under the cargo.

From Captain John Ramsey, South Shields.

"Columbia." (*See* p. 85.)

1. Yes, on one occasion.
3. None.
4. I never ventilated any ship except the one named in the accompanying form. I have had command of both wood and iron ships.
6. The hold was always filled quite up to the square of the main hatch, but with generally a large space left at both ends of the ship.
7. No.
8. I have always had a thermometer on board which I could have used.
9. No, I do not think so.
10. I never allowed naked lights in the hold.
11. Have carried all descriptions of coals from the north country, large and small steam coals and small smithy coals, also Welsh steam coals.
12. No.
13. I think the general opinion among north country captains is that ships are safer when not ventilated.
14. None.

From Captain Henry F. Scott.

1. Three instances of dangerous heating which was effectually subdued by the method described in letter.
3. Never had any directions from owners to provide against the danger, but allowed the expense of ventilators in all but one instance by them; was *once* told to take hatches off occasionally.
4. Horizontal, wooden, square tubes on each side running from end to end of lower hold; well perforated at sides and bottom, and connected to perpendicular tubes from the corners of each hatchway, the latter projecting a foot through hatches, to be able to attach windsails to them to drive air down and through the ventilators.
5. Constant in all except in very stormy weather, when the windsails cannot be used.
6. Few vessels will carry the coals right up to the deck for a long voyage, the stores and water required being heavy. I have always had an average vacancy of about 2 feet under the upper deck when laden entirely with coal. Smaller class of vessels having their cabin and forecastle below the deck, will load nearly full to the deck, but will then be deep, depending much on the kind of coal, light or heavy description.
7. Have always had thermometers kept lowered down the perpendicular tubes and noted the temperature daily in the ship's log book; on finding heat increasing used long probe rods, which are easily forced down to the bottom.
8. As above.
9. Of this I have no doubt from continued testing, especially during long calms; when the vessel has little motion heat increases rapidly. I have paid much attention to this particular effect.
10. Rarely any, when ventilated and the hatches kept off as much as possible. It is nearly impossible to prevent taking lights below or striking matches by seamen.
11. Both large and smithy coal, mostly the former, have few records of names of the collieries; have had both screened, double and single, and unscreened; the latter appear most liable to heat, particularly under the hatches where the dust forms a heap which cannot be ventilated.
12. In my cases "West Hartley" heated quickly, also "Cowpen"; have no record of others which I have carried as to name.
14. Respectfully beg to refer to letters on the subject.

12, Grove Street, Newcastle-on-Tyne,
May 1st, 1875.

Sir,

Actuated by a sincere wish to assist in lessening the chances of calamity by fire at sea, I respectfully address the following observations to you on spontaneous combustion in coal cargoes, and chiefly to submit to your consideration a simple and efficacious method of preventing ignition, and which has in three instances been perfectly successful in ships under my command, the result showing it to be a successful experiment reduced to practice and submitting to your approval whether it might be of sufficient importance to be communicated to the Royal Commission about to investigate the subject referred to. After a few remarks on cause I will describe the method referred to, which for simplicity of construction and ease in carrying out renders it available to all, if disseminated among ship masters and others who may be interested.

From a careful observation I am of opinion that there are four causes. First, from coals which give out gas without the aid of heat, even in a low temperature and which is

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greatly assisted by attrition in shooting them down the hatchways, and those in a vessel with closed hatches frequently explode before leaving port when a light is taken below.

Second.—From coal which does not emit gas at first, but after having been a month or two closed up in a ship's hold in tropical waters a gas is generated in them assisting an increase of heat and which unexpectedly culminates in an explosion (as in the case of the "Belcarreg" and other ships).

Third.—From small, dusty, or smithy coal, lying so compact that it is difficult to ventilate it.

Fourth.—From coals which are shipped in a wet state, say in rainy weather, and if unscreened and small are certain to heat in a short time. In this last description heat increases rapidly towards the last, of which I lately had an unmistakable proof.

In 1852 I took a cargo of coal from Sunderland to Madras without ventilators. After passing the Cape, not having been able to take off hatches for a considerable time owing to bad weather, were alarmed at finding smoke issuing from the cargo, with a strong smell of incipient gas. In this dilemma a panic came over my crew, and they insisted on getting the boats out and preparing to leave the ship. Now as danger and necessity often sharpens the wits, after looking at things in all its bearings I determined to try and save ship and life likewise. After a little trouble in getting my men to second me in my plans we went to work.

Happening to have on board some rod iron I roughly pointed a few of the bars and drove them down into the cargo in different directions, allowing them to remain awhile we drew them out, feeling them all their length with the hand, marking the hottest parts with chalk. By driving them down in all directions from the main hatchway I found that the heat was all in one place, forming a nucleus of about 10 feet in the lower hold and directly under the hatchway, the bars driven diagonally through the coal coming out quite cool. I then got four studding-sail booms roughly squared, and knocking down bulkheads and part of bulwarks to procure boards, we made a trunk about 16 feet long, 2½ feet square at the upper end and 3½ feet at the lower, in form of a square *cone*. We then dug down as far as we could, and placed the *large end* of the cone in the hole with a man inside, who dug out the coal from under it, driving the cone down from the top as the hot coals were sent up in buckets. After getting down about 7 feet we came upon the coal so hot that the man at the bottom could only remain a short time, and had to be replaced at short intervals owing to the great heat and smoke and putting his feet into wooden boxes which we made to save from burning them. We now found that as fast as the coal was cleared from the bottom, the trunk crept down *without forcing*, owing to its conical shape and the rolling of the vessel. In six hours we had it down to the keelson, and by removing each alternate board from the side of the trunk at the hottest part we grubbed out great part of the coal which was smoking, and would not have been long before taking fire. I then rigged a topmast studding sail as a wind-sail, tying the foot of it round the top of the cone, and thus forcing a strong current of air down to the bottom and through the sides where the boards were removed, and in about 24 hours, on going down our pit, we had the inexpressible pleasure of finding the temperature little more than milk warm, and by continuing the use of the windsail all heat and smoke disappeared, and ignition was prevented just in time.

On two subsequent occasions I have repeated the process, and always found it successful. I have invariably found the heating to commence right under the hatchways, but chiefly the main hatchway, the largest body lying there, and this I account for thus: The coals as they are poured down from the spout or bottoms of waggons perpendicularly, form an increasing heap of small and dust coal, as the large coal roll away down the sides of the pyramid thus formed, leaving a mass of small coal imbedded in dust in the centre of the hold, the large coal as they are trimmed to other parts ventilating themselves, while the heat is invariably generated in the undisturbed pyramid in the centre, and which will gradually extend to the surrounding parts if not prevented in time by the process above described. I may add that I have had to cut the core into several parts, joining one on to the other below the deck, when the state of the weather and sea obliged us to keep hatches battened down, so that we found no difficulty in getting a cone of 17 feet down, even with closed hatches, and thus saved ship and cargo.

I will now state a case which may be said to come under cause second.

In 1858 I took a cargo of coal out to Melbourne for gasworks, properly ventilated on my own plans, frequently attaching wind-sails to the upright tubes and forcing air all through the cargo. The barque "Lizzie Scott" sailed with me at the same time, and with the same kind of coal for Melbourne also, but *without ventilators*. My cargo heated a little, but I kept it down with the help of the wind-sails, and discharged in good order. The "Lizzie Scott" arrived at Melbourne apparently all right, but on discharging they found to their surprise that the cargo got quite hot as they worked down, and that the two hold beams of the part nearest the main hatch were burnt away, all except the ends. On getting further down they found nothing but coke, and that the keelson to the extent of about 20 feet had entirely disappeared, leaving nothing but the bolts sticking up, and that a corresponding area of the bottom ceiling was burnt away and charred an inch or so into the floor timbers. All this I saw myself; but the strangest thing was that there was scarcely any smoke, and before breaking bulk on arrival, they had seen no sign of smoke in any part of the vessel and never suspected fire, so completely had it consumed its own smoke. I attribute this case to the want of ventilators.

By the use of wind-sails attached to the upright tubes of ventilators I have frequently reduced the heat 15 and 30 degrees in as many hours in a stiff breeze, always keeping a couple of small thermometers lowered down the tubes, registering the increase or decrease of heat daily in the log. After heat has attained to a certain point the large coal crumble to fragments, accelerating the escape of gas as it is evolved by the increasing heat, thus augmenting the danger of explosion, and when it is discovered that the coal in the lower part of the cargo has become heated to a dangerous point it is useless to deluge it with water, the effect being only to form an impenetrable crust over the heated part, through which the water cannot descend, but finds its way down the sides where it is useless for the purpose.

In conclusion I may say the most important points are to use the probe rods frequently, and then if danger threatens not to put off too long, but use the means to subdue the heat before it gets beyond the power of control, and this I affirm can be done in most cases by adopting the foregoing method. The materials required cost but little, and to condense the whole into a few words, let a ship about to proceed on a long voyage with coal be provided with a few ¾-inch rods of iron, a moderate quantity of rough inch boards, some extra nails and (to save studding-sail booms) a few poles with those, and a knowledge of the construction of the cone, which is very simple, the watchful commander is prepared to checkmate a merciless enemy, insidious at first, but terrible at last.

I am, &c.
(Signed) HENRY F. SCOTT.

R. B. Peverley, Esq., Secretary,
Chamber of Commerce, South Shields.

12, Grove Street, Newcastle-on-Tyne,
28th May 1875.

SIR,

I BEG to return the circular of questions relating to spontaneous combustion in coal-laden ships which I have had the honour to receive.

As the questions therein appear chiefly to apply to cases of *actual fire* I am not in a position to attach the answers in direct form, owing to never having had a vessel under my command actually on fire, and having in my cases of dangerous heating always succeeded in preventing ignition in time.

My exertions have been directed chiefly to the means of prevention and subduing of heating before it got beyond control, for if allowed to heat to a certain degree explosion or combustion is certain to ensue if means are not used to stop or check it in time, and this I have proved can be effected with comparative ease by the method which I have in three instances adopted and which in each case succeeded to my utmost wish. I lately addressed a letter to the Secretary of the South Shields Chamber of Commerce describing the method, also describing how effectual it proved, and I am informed by that gentleman that he had kindly forwarded the letter to you, and to which I beg respectfully to refer you for description.

Taking a deep interest in the subject, I beg with deference to submit to the consideration of the Royal Commission the method referred to.

In the letter above-mentioned I described my first case, and now will as briefly as possible give the other two.

In June 1862 I sailed from Sunderland in command of the ship "Areta," wooden ship, of 678 tons register, laden with 700 tons of "Hartley's", large coal, single screened, and about 200 tons glass on the top of the coal, bound to Shanghai, the coal having wooden ventilators. After being three months at sea, having previously found by the thermometers in the tubes that the coal was heating, I

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found by the probe rods that the heat under the hatchways in the lower hold (where it invariably generates) that fire was imminent before I could reach port (I was then entering the Pacific). Being prepared with materials I lost no time in making the cones, as described in the letter referred to, and sunk them down to the bottom of the hold, bringing up the coal dangerously hot, the thermometer buried in them showing 180°, and the heat had been increasing rapidly for the few days previous. I put a cone down all three hatchways where I found the greatest heat, and by attaching large windsails to the mouths of them the heat was reduced so quickly that in a few days it subsided to 100°. On arriving at Shanghai it had receded to 90°, but in the bottom round the cones I found on discharging the coal had the appearance of semi-melted bitumen, showing it had been subjected to great heat. Those coals were partly shipped in a wet state, and although they were pierced fore and aft with ventilating tubes I am convinced that actual ignition would have taken place in a short time if the means described had not been resorted to. * * *

"Touching explosions, I am convinced that if the hatches of a coal-laden ship are kept off whenever the weather permits, and if the ship be provided with properly arranged ventilators on a principle I would be glad to explain (and they are anything but costly), such disasters would rarely occur. Hatches can generally be kept off night and day in the trade winds, and the ventilation be made *continuous* the whole way through the longest stage of the voyage and where the heating is most to be apprehended, for undoubtedly it is between Cancer and Capricorn that the greatest danger of heating and emission of inflammable gas exists, but coals shipped wet are the greatest danger of all.

"In all cases of heating under my notice I have found that *with the exception of the coal being wet all through* the first indication was found immediately under the hatchways, particularly the main one where the greatest body is, and from experience have the greatest confidence in the efficacy of the cone method in preventing actual combustion from taking place. Moreover, the extreme simplicity of the method, and the ease with which it can be carried out, renders it available to those who may be in peril of conflagration in a part of the ocean where there is no escape except the doubtful one of boats.

In conclusion, I have some misgivings that addressing you to such length may be deemed informal, and not in accordance with the intention of the Royal Commission to elicit information on the subject, but as the questions in the form appear to apply only to cases of actual fire I have ventured to submit the foregoing experiences in the present form, confining my remarks to *prevention* of actual ignition, and actuated by a sincere desire to contribute towards lessening the number of terrible casualties of which the writer has for many years been in dread.

I am, &c.

J. M. Carmichael, Esq., Secretary. HENRY F. SCOTT.

From Captain A. PEARE, Swansea.

'Henry Bath," "Alpha." (*See* p. 90.)

1. Coals have heated and cooled again on the voyage.
3. Instructed to give all possible ventilation by keeping the booby hatch off at all times the weather will permit.
4. By running planks fore and aft on each side of the stanchions from keelson to the deck. Ships all of wood.
5. When hatches are closed, the iron ventilators through the decks are sufficient.
6. The hold is generally filled up at the main hatchway, but settle down after being a short time at sea.
7. By lowering a thermometer occasionally down to the keelson, and by running a long rod of iron as far as possible into the cargo.
8. Thermometer.
9. Yes.
10. None required with smelting coals.
11. Smelting coal, which is oftener small than otherwise. Broadoak, Techan, Mynydd y Bach.
13. Masters appear quite satisfied with our system of ventilation or separation.
14. That shippers should be particular about the class of coal they ship for long voyages, and colliery proprietors should ship clean coal. From the year 1860 to 1867 I was in command of several ships carrying coal from Swansea to West Coast of South America. I adopted the system of separation by running planks fore and aft the ship upon each side of the stanchions, from the keelson to the upper deck beams, and never had any case of spontaneous combustion or explosion, and from 1867 up to the present time I have superintended the loading of at least 150 ships with coal, principally smelting coal, and have always adopted the same system of separation, and have only had the two cases of spontaneous combustion mentioned in the paper. The "Henry Bath" put into Port Stanley and discharged part of her cargo. The coals were much heated, but no fire. They turned the coals over in the hold, and took the remainder they had discharged in again and proceeded on their voyage. The "Alpha" put back to Port Stanley and discharged part, and found the inside planking and several of the floors charred and burnt; she was partially repaired and took in her coals again and proceeded on her voyage. I attribute the heating of the coal to its being very small and very wet when shipped. I adopt the same system of separation with steam coal, and find it answer well, and vessels having iron ventilators through their decks will always be clear of gas and very little fear of explosion. I think the great number of casualties to ships loaded with coal in the last two years may be attributed to the high price of coal, and a great many of the coal proprietors have not been particular about the quality of the coal shipped; and if shippers and colliery proprietors only act conscientiously in regard to the coal they ship, and ordinary care used in the loading and ventilation, coal ought to be a safe cargo. I have always found the under-mentioned coal quite safe with my system of ventilation or separation. At Swansea the Broadoak, Techan, Mynydd y Bach,—the "Alpha" and "Henry Bath" excepted,—Rhyding; Nixons and Powell Duffryns (steam); at Shields the Tanfield Moor; at Liverpool the Ornell. I consider the system of putting a ventilator at each hatchway when loaded with smelting coal of much more harm than use, with steam coal it may be of some use, but as a rule they are either broken or filled with coal before the ship is loaded; the separation with boards or planks is expensive, but safest.

From CAPTAIN of the "NORTHBROOK," forwarded by Messrs. Adamson & Ronaldson.

'Northbrook." (*See* p. 91.)

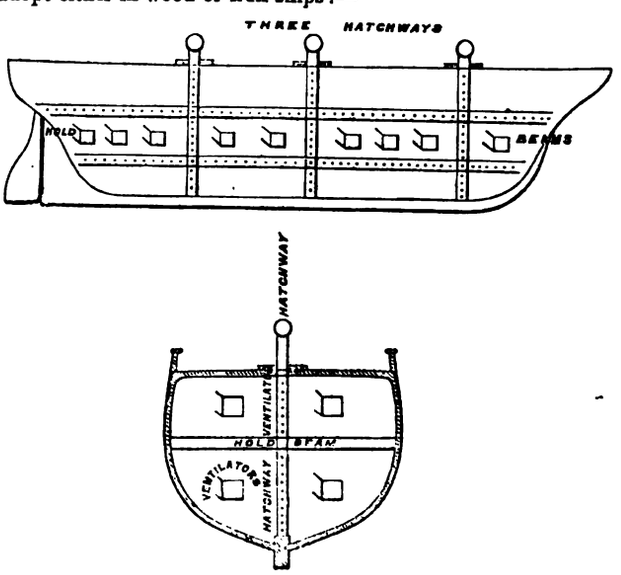
1. No, except as stated in enclosure.
3. It is not usual for me to receive any special instructions except from Captain Muscatt (ships husband).
4. Establish a free current of air through the hold. Iron wood.
5. Constant, except in cases of very bad weather.
6. No, spaces are always left for a free current of air.
7. Occasionally.
8. Thermometers.
9. No.
10. No naked lights below, and all lights extinguished at 9 p.m. except those absolutely necessary.
11. Not known.
12. I cannot tell.
13. I don't know.
14. Nothing more than a complete system of ventilation.

From Captain WM. MURCH, Newcastle-on-Tyne.

1. Spontaneous combustion has taken place on board of a steamer I was chief officer in, by the overheating of the coal in bunker (Midridge coal), shipped at Hartlepool; it was caused by the coal laying against the heated bulkhead of engine room.
2. There was no damage done in this instance as it was in deck bunker, and with a copius supply of water was soon extinguished,

* * * * *

4. The following diagram will show the system I would adopt either in wood or iron ships:—



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This shows four trunkways fore and aft the hold, say 8 inches square, perforated with auger holes at every 18 inches, connected with a trunkway in each hatchway, the same protruding 6 feet above the hatch to keep the water out in bad weather. This was adopted on the last voyage I was out to India and found it answer well.

5. The ventilation would be constant because the tops of ventilators in hatchways could be fitted with their heads to slew to leeward, by that means preventing any seas breaking into them, and by that means keeping up a constant circulation of air through the coal. The present system generally used is to take off the hatches in fine weather, which only allows the surface heat and gas to escape, and I have been a fortnight rounding the Cape of Good Hope in winter when it would not have been prudent to have taken a hatch off.

6. It is customary to fill up square with the hatchway, but there is generally a space below the deck, the height of the deck beams.

7. I never tested the heat of a ship's hold, although in the tropics when the hatches have been taken off it was found like a moderately-heated oven, more especially in iron ships with rice cargoes, as such sweats tremendous, therefore the same system of ventilation applys to them.

8. I have seldom seen a thermometer on board of ships, except those connected with barometer.

9. I have great confidence in saying that coals has a great tendency to heat in the tropics. Some years ago I was in Havana, where I saw some hundreds of tons of coal laying in a heap 20 feet deep take fire by getting wet and being exposed to the sun's rays, although exposed to the open air.

10. Where there is any suspicion of gas don't use any lights whatever below.

11. Both steam and gas, mostly steam.

12. Most kinds of coal are liable to spontaneous combustion if shipped in a wet state and destined for a long voyage.

13. I have spoken to many shipmasters upon the subject of spontaneous combustion, and found many to agree with me that coal ships on long passages are like coal mines, and ought to be treated the same in respect to ventilation, and I may say the same applys to all ships loaded with inflammable material.

14. Remarks. 1. All sailing ships bound south of the equator or continent of America or West Indies to be ventilated through the coal as proposed. 2. All coal coming from the collieries to be brought in covered waggons to ships. 3. When not teaming coal on board ship, hatches to be kept on, preventing any water getting into coal. I think if those simpie, yet efficient, means were used, and have a proper authority to see it was done, we would seldom hear of such lamentable cases as the ships "Euxine" and "Arracan," and I have no hesitation in saying many more that have never been again heard of, besides saving much capital.

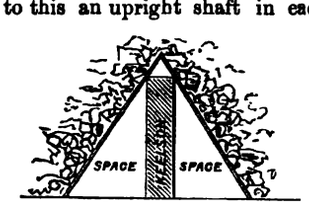
From Captain JAMES MUIR, Liverpool.

1. No.

2. Never occurred with me.

3. Yes; by ventilation as a preventative. No; as regards steps to be taken in case of fire.

4. Usual method of ventilation adopted by me, and approved by owners, as follows:—Fore and aft the keelson on each side by means of wood laid from top of keelson to the floor, angled so as to give good air space and view. In addition to this an upright shaft in each hatch from



floor to upper part of hatch combings, with sufficient span at bottom to cover ventilation of keelson. Fore and after hatches kept off whenever weather admits. Wooden ships, colonial build.

5. Constant but sluggish in calm weather and smooth sea.

6. Fore and after hatches generally clear. Main hatch often filled up to top of combings. There ought to be a free air space fore and aft under main deck.

7. Yes, by thermometer lowered down the ventilation shaft. Twice a day.

8. Every ship coal laden should have thermometers on board and the captain be instructed to use them.

9. No, I found in very hot weather, that the temperature of the hold at foot of shaft was lower than the temperature in the shade on deck.

10. None. Except for the first few days after the ship was laden. Hatches should not be put on immediately.

11. Steam and gas, generally lump, cannot name colliery or seam, steam coal usually double screened, have carried in all 14 cargoes. Cardiff, Tyne, and Liverpool.

12. I have been informed by steathmen in Cardiff and the Tyne that some classes of coal are more dangerous than others, but cannot say from own experience.

13. The majority are in favour of ample ventilation, and many think with myself that sufficient care is not taken in ventilating the ships or in keeping off the hatches. Cases have been mentioned to me where the hatches have not been removed for the entire passage.

From Captain CLOAKE, Cardiff.

1. On two occasions an explosion of gas occurred, caused on both occasions by engineers taking naked lights in the after compartment.

3. Many owners give instructions to attend to ventilation of hold by opening hatchways when weather allows such to be done, also by putting ventilators down in holds. So far as my own instructions went I had no special orders, and my experience was greater than my owner's, and he would not have objected to any means being taken to ensure safety.

4. I had 25 years' experience in command, 12 years of that time in steam, and I on all occasions when opportunity occured opened the hatchways, two if possible, one for down and other for upcast. I have heard of instances of air being forced by pumps into the hold, thus causing circulation. Above explosions were in steamers built of iron.

5. In steamers I commanded, being for the fruit trade, we had proper ventilators fitted; in this case the ventilation was pretty constant, but where only hatches were available it depended on the weather and also to attention of the officers in causing the hatches to be opened.

6. With Welsh coal the holds are very rarely full, being often much space left, especially at ends of the ship; the bodies of the hold or in the neighbourhood of the hatchways are often filled up to deck, but the large Welsh coal generally leaves vacancies near the deck. One great stoppage of ventilation is caused by trimmers to save labour having at finish of loading to cram the hatchways very full, filling up to top of combings, packing same preventing gases escaping freely.

9. Coal in my opinion has a greater tendency to heat in the tropics than in the cooler latitudes.

10. For going into holds I have always carried safety lamps, also for going into funnel of steamers and watertight compartment; at same time open lights are mostly used in the cabins and forecastles.

11. I have loaded all kinds of coal, mostly Welsh coal, at times the coal has been double sometimes single screened, and also carried small coal as cargo; both explosions occurred with large Welsh coal.

12. We have some coals, both in the north and Wales containing much more gas than others; but regarding spontaneous combustion, in my opinion this depends on the state the coal is shipped in, and also whether it is comprised of much small coal in the cargo; again, some Welsh coal after being wet and then shipped falls all to dust, and this would in my opinion foster heat.

From Captain BELDRUM, Greenock.

1. No.

3. None but to see the ships ventilated in the usual manner.

4. An air shaft running fore and aft each side of the keelson; second, another running same way half way up in the lower hold communicating with the air shafts down each hatch. Both wood and iron.

5. Constant at all times, but freer in stormy weather.

6. Coals should not touch the upper deck and a passage left round the wings 'twixt decks and lower hold.

7. Have never done so.

8. None but the common thermometer.

9. I am of opinion that it does.

10. Never permitting any below.

11. Cardiff steam coal, coal shipped from Birkenhead to Bombay and from Clyde to Bombay.

12. Am not prepared to answer this question, but fancy those from the Tyne the least safe.

13. Insufficient ventilation and putting on the hatches too soon after being loaded.

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14. I am also of opinion that were the precautions generally adopted that I have stated in answer to paragraph 4 and the cargo lowered into the hold by hand instead of from "tips" or "large steam cranes" as is usually the case, fewer losses would occur from fire. I would also add that no ship intended to go round either Cape of Good Hope or the Horn ought to be allowed to take in coals otherwise than by basket or wheelbarrow lowered into the hold; when from tips or steam cranes they lay in solid mass under the main hatch, where fire usually first breaks out, the ventilation either partially or altogether destroyed, just sufficient to fan the flame but not enough to allow the foul gases to escape. In my opinion ships would be safer without any ventilation than it in an imperfect state.

From Captain JOHN GIBBS, Birkenhead.

1. No.
3. Only to see carefully to the proper ventilating of the cargo during the course of loading, and this is effected by laying ventilators fore and aft along each side of the keelson, and the same on each side of the lower hold, 5 feet under the beams, all carried out to the ends of the ship; these are all connected with large up and down ventilators in all the hatchways. I have commanded colonial-built vessels of birch, herekmatack, pitch pine.
5. The ventilation is constant.
6. The main hatch is frequently so filled, but should not be.
7. Occasionally by means of a thermometer suspended in hatch ventilator.
8. Thermometers.
9. Becalmed, and more particularly during rains. I am of that opinion it does.
10. That none are used, except in safety lanterns.
11. The North Wales steam coal, as it is produced from the collieries, mostly Bryn Mally and Tron, Brymbo, Broughton.
12. In my experience none more liable than others, but undoubtedly there are some.
13. That the foregoing amount of ventilation generally introduced on board coal-laden ships, if fairly distributed about the cargo, may be looked upon as the greatest safeguard against spontaneous combustion or explosion, but this must be followed up by the constant attention of those on board to the keeping open of the hatches on every available occasion, at the same time keeping the coal dry. These are precautions I have had rigidly carried out during my 13 voyages with coal, and one with patent fuel to India, and in not one instance has the cargo been overheated.

From Captain W. RANKIN, Greenock.

No.
4. Do nothing further than what was provided before the ship sailed, and the ships I commanded were principally wood.
5. Ventilating by the trunk was regular and found satisfactory enough.
6. Surrounding the main and after hatchways the coals have generally been packed close, but there have always been blank spaces in the hold forward and aft.
7. Not usually done by me, but think it highly desirable that it should be so, seeing that thermometers could easily be lowered down the ventilators.
8. Thermometers are generally provided for ships use.
9. It never occurred to me that the tropics have any such effect.
10. Not to admit any light into the hold unless well screened by a lantern.
11. I have no further particulars to give as to the character of the coals carried further than stated in the replies by me as an owner.
12. I believe there are coals more subject to explosion than others, but not being sufficiently acquainted with their characteristics I am unable to give further information.
13. I have never heard any better suggestion made than ventilating by trunks.
14. I may mention that in my early days of sailing in coal-laden ships spontaneous combustion was not thought of, and no provision whatever was made to avoid it.

From Captain H. VELRUNT.

1. Spontaneous combustion took place in the bunkers of a steam transport I was in during the Crimean war.
2. I think it was patent fuel from Swansea, and it ignited on two occasions, steaming for Malta and after arrival.
4. Keep the hatches off where possible. Wood and iron.
6. There should be spaces left at each corner of the hatch to allow the air and gases to escape or a man to get in.
8. Common thermometers.
9. Yes.
12. Salved cargoes of coal or fuel having been under water should not be shipped for long voyages.
13. Not good.
14. Coals should be covered in the waggons if intended for long voyages as a protection from heavy rain. Candles should not be allowed for trimming as they are allowed to lie about and form liquid grease when heated.

C.—STEATHMEN, COAL SHIPPERS, AND OTHERS.

ABOUT 100 OF THE FOLLOWING PAPERS OF QUESTIONS WERE CIRCULATED AMONG STEATHMEN, COAL SHIPPERS, AND OTHERS.

QUESTIONS TO STEATHMEN, COAL SHIPPERS, AND OTHERS IN CHARGE OF COAL BEFORE SHIPMENT.

1. What time usually elapses before coal newly raised from the mine is shipped for exportation? And has there been any change in this respect of late years?
2. Are any precautions taken to shelter coal during wet weather while it is waiting shipment? Does it often occur that it is left in open railway trucks for days together?
3. Is it, or is it not, the custom to ship coal in all weathers?
4. Can you suggest any measure by which coal could be better protected from the weather before shipment without serious inconvenience or expense?
5. State the heights at which the coal usually falls from the wagon into the ship's hold?

Please write "Confidential" against any of your answers which you desire to be so treated.

The following are some of the REPLIES received to these QUESTIONS.

From Messrs. A. FINNIE AND SON, Kilmarnock.

1. Generally shipped same day as raised or following morning.
2. None—seldom for days together.
3. Yes, in all weathers unless prevented by storms.
4. No.
5. From 2 or 3 feet when coal is up to hatchway, to 18 or 20 feet when hold is empty at commencement of loading.

From Messrs. HUGHES AND NEPHEW, Liverpool.

1. Almost all coal from North Wales comes from some distance. Supposing 100 tons are raised from the pit during the day (as at our Cœd Talon Colliery), they are screened, loaded up, and forwarded before the evening, and arrive at Birkenhead in the course of the following day, and are sometimes shipped at once, sometimes not for days.
2. Coal is never conveyed in covered waggons or sheltered during wet weather. It often occurs that coal is left for days together, sometimes for three or four weeeks, in open trucks at Birkenhead before it can be shipped.
3. Coal is shipped in all weathers.
4. Coal might be protected from the weather by tarpaulin coverings, but this would cause inconvenience and expense. To provide other shelter at Birkenhead, say by erecting sheds, would be almost impracticable owing to the immense traffic.
5. As we never load our vessels under the tips, but only by hand barrows, we cannot say from what height coal usually falls from the waggon into the ship's hold.

From Mr. E. C. DOWNING, Cardiff.

1. This varies exceedingly. When the demand is continuously brisk, 12 or 16 hours would be the average time from the mine to the ship's hold; sometimes a delay of many days occurs. In consequence of the greater regularity

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of business by increase of steamers, the tendency of late years has been to reduce the interval between the time of working the coal and the shipment.

2. None whatever, except in the case of gas coal, which by some firms is protected by tarpaulins placed over the waggons. The coal is often left in open railway trucks for many days together.

3. It is the custom to ship coal in all weathers by night as well as by day.

4. I think that coal liable to ignite spontaneously, when intended for shipment to distant parts (say where the voyage exceeds three weeks or a month) should be protected from the wet by tarpaulins over the waggons. This precaution should be enforced by some legal enactment, the expense would be trifling. Cardiff steam coal proper will not ignite spontaneously.

5. The mode adopted for shipping coal at Cardiff is this. The coal is emptied from the waggon into a long shoot extending from the tip to the hatchway of the ship. At first the coal is lowered into the hold in a box (arranged with a counterpoise) until a large heap is formed. When the box cannot longer be used the coal falls from the point of the shoot into the hold on the coal, a distance of five or six feet, until the hatchway is filled after which there should be no distance for the coal to fall.

From Messrs. JOHN PIRIE & Co., London.

1. This depends on the state of trade, when demand is good the coal is put on board with the least possible delay, often in a few hours. When trade is bad, it has sometimes to wait a market on the bank or in trucks. There has been no change of late years in this respect.

2. No.

Yes, in wet weather this must be so, as there are no sheds at collieries for loaded waggons, and they are exposed during the journey from colliery to place of shipment and there till shipped.

3. Often in wet weather.

4. Only by having trucks covered which is scarcely practicable.

5. Depends where and how shipped, by shoot or drop; a heap is generally allowed to acumulate under hatch so that coal slides down sides of pyramid instead of falling into hold.

From Messrs. MERRY and CUNINGHAME (Limited), Glasgow.

1. From two to ten days; average four to five days. It very seldom occurs that coal has to stand ten days in trucks previous to shipment. The time it has to stand depends very much on the state of trade; when there is a good demand for coal it is not kept standing in trucks very long. Matters in this respect have been much the same for a number of years.

2. No precautions are taken, and it often happens that coal is left open in trucks for several days waiting shipment.

3. It is the custom to ship coal in all weathers.

4. Coal waiting shipment could not be protected from the weather without incurring great expense for erecting sheds, as it has to stand at the pits longer than at the shipping ports because the railway company will not take coal forward until the vessel can get into a crane berth.

5. From three to six feet to deck of vessel, according to size of vessel and state of the tide at time of shipment.

From Messrs. W. S. PARTRIDGE & Co., London.

1. We believe districts differ in their mode of acting on this point. At present and for some years very little in North Wales has been put on the bank for shipment. The rule is to put newly-raised coal direct into waggons, and send the waggons by first train to the ship.

2. Not as a rule; they may occasionally get sheltered. Sometimes.

3. Where tips are used it is seldom that they are allowed to stand idle at Birkenhead, where we load a large quantity by hand-barrow; the men won't work in very wet weather.

4. We do not think it possible, as the expense would be too heavy.

5. The height various from two to 25 feet, depending on depth of vessel's hold; but if captain or owner will lower carefully about 100 or 150 tons, a mound will be formed under main hatch, and the fall of the coal will be five to seven or eight feet. The longer drop would not be for more than the first 40 tons, as the mound would be rising. Captains do not like the extra expense of lowering.

From Mr. JOHN TRAILL, Cardiff.

1. When trade is regular, and the supply of shipping sufficient, much South Wales coal is shipped in 24 to 36 hours after being raised. No work is done during the 24 hours of Sunday. The increase in the number of steamships which require quick despatch, improved shipping facilities, and the extension of railway transport, have much tended to hasten shipment of late years.

2. None, except rarely in the case of small consignments of gas coal. It does often occur; sometimes it is left for weeks. All our trucks are open.

3. It is.

4. I think I ought here to premise that many kinds of South Wales coal and all our good steam coals are not liable to spontaneous combustion. With regard to the descriptions so liable, I believe that only a small proportion is sent to distant ports, most of it going for home consumption. Though it would be very desirable that such coal should be protected from rain by tarpaulins, when intended to remain say a month in a vessel's hold. This measure would entail considerable if not serious inconvenience and expense.

5. The mode of shipment usually adopted here prevents the coal falling any great distance; the trucks are brought to the upper extremity of a "shoot," set at an angle of about 40° with the horizon, and of which the lower end reaches to the hatchway. Into this the coal is "tipped," and may if necessary be "screened," or sifted while passing down the shoot, which is furnished with bars for the purpose. The coals then run into a large box with a hinged bottom, by means of which they are lowered into the hold until a heap reaching to within a few feet of the hatchway is formed, when loading proceeds without the box.

From Mr. JOSEPH FOTHERGILL, Agent to the Cowpen Hartley and Strakers West Hartley Coal Company, Newcastle-on-Tyne.

1. Five to six hours there has been no change.

2. None. No.

3. It is the custom to ship coals in all weathers to keep the mines in regular work.

4. No.

5. The coals fall from the waggons into spouts and thence run into the ship's hold, the end of the spout generally resting on the combings, therefore the fall is to the bottom of the ship until she is run up with cargo.

From Messrs. JAMES SMITH & SON, Glasgow.

1. Usually not more than 10 days, no change of late years.

2. No precautions are taken. It does.

3. It is the custom to ship coal regardless of the weather.

4. We know of no means except that railway companies might provide covered sheds for coal intended to be shipped long voyages, and remove such coal only during dry weather.

5. About five feet above combing of ship's hold. We may add, during some 15 years our firm have shipped a great many cargoes of coal, in no case have we ever heard that combustion has taken place except in one case a ship named the "Workington" loaded by us in June 1874, with 1,640 tons of splint coal was we understand burnt off the River Plate. Her cargo was shipped in very wet weather, and to this cause we ascribe the burning.

From Mr. RD. BITTABY, Cardiff.

1. Coal is generally sent as fast as it is raised, and is usually tipped within 24 hours; there has been no change in this respect within my knowledge.

2. None. Not as a rule.

3. Yes.

4. As nearly all the coal sent down for shipment rarely stands for any length of time, I do not see that any protection is at all necessary.

5. The drop from the point of the shoot into the hold after the box has been used would be about four feet.

From Mr. JOHN MACDINAN, Glasgow.

1. About 48 hours. No change.

2. None. The coals frequently get wet in transit from colliery to port of shipment, and I have known instances of trucks standing loaded for days by ship not being ready.

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or vessels being in time to load at crane before the ship for which the coals are intended.

3. Customary to ship in all weathers.

4. Only by tarpaulins, but this would be expensive, and tarpaulins would require to be provided by railway companies, as nearly all coals for shipment here are carried in railway trucks, and the trucks after being discharged are probably sent to a different colliery from that at which they previously loaded.

5. Trucks with about 6½ tons of coals are lifted from wharf by steam crane, and lowered on board the vessel to within two to three feet of hatchway, the fall therefore depends on depth of ship's hold and as she loads is decreased.

From Mr. McCullough.

1. Coal is put into waggons and will average about 24 hours ere it is shipped. Has been no material change the last few years. From 5 to 20 years ago, if a colliery was short of waggons, coals would be teemed by, *e.g.*, put in a heap, but this is very expensive.

2. No precautions are taken to shelter coals in waggons during wet weather, and sometimes from various circumstances coals will be left in trucks for several days.

3. Yes, ship in all weathers as a rule.

4. Coals could not be protected from the weather without incurring serious expenses.

5. This varies very much. Some colliers use large iron tubes, which are filled at spout, then lowered into hold; bottom opens by means of a clutch, and the coals are left at bottom of hold, where swing drops are used. Waggon is lowered close to deck; bottom opens; the coals fall into hold of ship; generally in Wales spout reaches within 6 or 8 feet of deck, and from there falls into hold.

From Mr. John Evans, Foreman, to James Thick and Sons.

1. Generally from a week to a fortnight, but in some cases as little as 24 hours. No change since the railway was completed.

2. No precautions are taken to shelter coal, and it is frequently left open for days.

3. Coal is shipped in all weathers.

4. No.

5. From 15 to 20 feet, according to the mode of shipment.

From Messrs. Barnes, Guthrie, & Co., Cardiff.

1. Coal generally shipped within 24 hours after coming out of the mine, seldom, if ever, stacked in this country, excepting in cases of cargoes being relanded; often stored in foreign depôts for many months.

2. No precaution taken. Seldom left in trucks for any length of time, and then only in extreme cases a few days.

3. Coal shipped in all weathers.

4. No.

5. The waggon tips the coal down a shoot about 15 feet long, and from thence the first portion of the cargo runs into an iron box, which is lowered into the hold. The coal falls at an average about 6 feet all throughout an entire cargo.

From Mr. F. E. Stamford, Cardiff.

1. Coal is frequently shipped within 24 hours after it is worked from the mine. Owing to the great pressure for coal during the last three years, the waggons have been emptied sooner than in former years.

2. No.
Yes.

3. It is.

4. No.

5. The coal is tipped out of the waggons down a shoot (of about 15 feet long) to the hatchway of the vessel; the distance from the hatchway to the bottom of the hold is dependent upon the size of the vessel.

From Mr. D. Turner, Peninsular and Oriental Steam Navigation Company, Liverpool.

1. Since the commencement of the late strikes in the coal trades and the consequent short delivery, I find the time elapsed between the dates of leaving the mines and that of shipment is from 24 to 48 hours. I cannot answer the latter question, as my experience does not go back so far.

2. None. Yes.

3. Yes; as required.

4. Certainly not without covered trucks or covered sheds, which would involve expense.

5. Eight to nine feet, the way the sailing vessels are loaded for the Peninsular and Oriental Company.

From Mr. Alexander Dalziel, Cardiff.

1. From 12 hours to three or four days, according to the demand?—No.

2. No, excepting in the cases of certain consumers, who pay a little extra price for having the coals in the best condition?—Yes.

3. It is the custom to ship the coal in all weathers.

4. Coal is too bulky to be covered without great expense and inconvenience.

5. From one to five feet. The coal is lowered by a mechanical contrivance until a cone is formed in the hold.

If this precaution be neglected, then the fall of the coal is great, from 12 to 30 feet; the rule is, however, very fairly adhered to.

From Messrs. John Carr and Son, Newcastle-on-Tyne.

1. From three to 24 hours. No change.

2. None. No.

3. Yes.

4. No. We have been the shippers of several cargoes of steam coals, the vessels carrying which have been reported as lost with all hands, or burnt, but our evidence would only be hearsay. We believe many cargoes of coal are ignited, especially on board of British vessels, through the unfortunate system of keeping the ship's stores above the cargo in the hold, necessitating the use of candles at the exact point where the escaped gas must accumulate.

5. Coal falls from waggon to bunker at top of spout, in general about five feet, and the spout rests upon the combings assisting the fall to the depth of ship's hold, and the quantity of coal shipped.

From Messrs. T. Beynon & Co., Newport, Monmouthshire.

1. Generally speaking, it is raised from the mine, sent down to port, and shipped without delay, if the vessels are ready to receive it.

2. None that I know of. It often occurs that it stands in trucks completely exposed to the weather for some days previous to shipment.

3. Yes.

4. No.

5. In this port (Newport, Monmouthshire), the truck or coal is raised by hydraulic power, and emptied into a shute, the end of which rests or nearly so on the ship's coomings, and the coal when the shute is full is eased into the ship's hold by means of a "wing;" it follows that it is only about the depth of the ship's hold the coal has to fall, and in ships of great depth measures are taken to break this fall.

From H. Cloake.

1. Very often coal when in demand is shipped within a few hours after being worked, or filled into trucks, and I am not aware that any change has been made lately.

2. Coal being filled into trucks open at the top at collieries where worked, and in this manner remains in the open air until shipped, and often for days, sometimes weeks, if the coal does not meet with ready sale or is a coal of inferior class and not much in demand.

3. Coal is shipped in all weathers, and rain must be *very* heavy to prevent or delay shipping.

4. I can suggest no other method than by having covered trucks; in most cases this would not impede or cost more shipping coal, but would delay the loading of trucks at collieries and entail expense there.

5. Coal in Wales is mostly shipped from a shute, which shute goes into the hatchway, therefore the height of the fall of coal would be at commencement loading depth of ship's hold. After coal comes up in centre of ship the fall of coal is almost nil. Some coals are lowered into the hold from boxes until there is a heap formed. This is done to prevent breakage.

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D.—PAPER OF QUESTIONS ENCLOSED IN FOREGOING CIRCULARS A. AND B.

THE FOLLOWING IS THE PAPER OF QUESTIONS ENCLOSED TO SHIPOWNERS AND MASTERS, TO BE FILLED UP BY THEM IN THE EVENT OF THEIR HAVING HAD EXPERIENCE OF AN ACTUAL CASE OF SPONTANEOUS COMBUSTION OR EXPLOSION IN COAL-LADEN VESSELS.

1. Name of ship, her class and age, and whether steam or sailing.
2. Date, and port of loading.
3. Destination.
4. Date, and place of combustion or explosion.
5. Of what material the vessel was contructed.
6. Did she make much water, or otherwise?
7. Her (net and gross register) tonnage.
8. No of statute tons of coal shipped.
9. Denomination of coal carried, the name of the colliery, which seam, and whether double or single screened.
10. Name of exporter.
11. Whether the ship's hold was ventilated, and if so, how? And state the material used.
12. In what part of the ship the combustion or explosion took place.
13. How long the coal had been on board.
14. How long the coal had been out of the pits before being put on board.
15. How was the ship loaded, and, if from waggon, from what height did the coal fall into the hold?
16. State of weather at time of loading, and generally during her voyage.
17. Condition, as to moisture, of coal when put on board, and also during the voyage.
18. Was any indication given of the cargo being heated before the fire broke out; if so, how did it show itself, and how long before the fire?
19. Was the temperature of the hold taken during the voyage, and, if so, how, and how often?
20. Was the hold completely filled with coal up to the hatches?
21. During what proportion of the voyage were the hatches open, and did water ever get down, and to what extent?
22. What measures were adopted when there were indications of the cargo heating, and also when the fire broke out?
23. What special appliances, if any, had you on board for the extinction of fire?
24. To what causes do you attribute the spontaneous combustion or explosion in this case?

Please write "confidential" against any of your answers that you desire to be so treated.

PARTICULARS OF CASES OF SPONTANEOUS COMBUSTION SENT IN REPLY TO THE FOREGOING QUESTIONS.

(These cases will also be found in the tabular statements of vessels bound from Great Britain to foreign ports, which suffered from spontaneous combustion. See page .)

"COLUMBIA."

From Captain JOHN RAMSEY (Master) by Mr. THOMAS HENDERSON, Shipowner.

1. "Columbia," 4 years A 1, two years old, sailing ship.
2. Liverpool, January or February 1850.
3. Aden.
4. First off the Cape of Good Hope. When about 90 days out.
5. Wood.
6. No, she was a very tight ship.
7. 517 tons, 633 tons.
8. About 750 tons.
9. I think it was North Welsh coal; cannot give any further information.
10. Coals were for Peninsular and Oriental Company.
11. Ship's hold was ventilated with wood ventilators laid fore and aft, and up and down into the fore main and after hatches.
12. Was first discovered just abaft the fore hatch.
13. About 100 days.
14. Unknown.
15. Entirely from craft.
16. Wet weather whilst loading. Fine-weather passage from leaving Liverpool until fire discovered.
17. Coals wet when taken on board.
18. Yes, for 10 or 15 days before fire broke. Could find a great heat coming up the after hatch.
19. No.
20. Filled up to the main deck in the way of the main hatch, but a space vacant at both ends.
21. Fore hatch was often off, and the after hatch having a booby hatch over it was never closed.
22. So soon as the fire was discovered the carpenter bored a hole through the side, and water was allowed to run in until there was 10 feet in the hold at which height the fire was supposed to be, and when the fire was supposed to be extinguished was pumped out. About a fortnight after the fire again burst out, and the same expedient was used, when 12 feet was run in.
23. None, except the small deck pump.
24. I attribute it to ventilation; up till last year I was constantly employed carrying coals of all descriptions to the East Indies, and on no occasion were the cargoes ventilated, and I had no mishaps.

"ALFRED."

From Captain JAMES FINLAY.

1. "Alfred" of Belfast, sailing ship, classed at Lloyd's five years old.
2. September 1850, London.
3. Valparaiso.
4. January 9th, 1851, off the port of Talcahuano, Chili.
5. Wood spruce, built at St. John's, N.B.
6. A moderate quantity.
7. 1,073 tons register.
8. 1,050 tons, not a full cargo.
9. Transhipped from several collier brigs which brought the coals from the Tyne. Do not know from what colliery, or if screened.
10. Do not know; was bought in the London market by the owner of the ship.
11. Not ventilated.
12. A little before the main hatch, starboard side, about the centre of the body of the coals.
13. Nearly four months.
14. Cannot say, suppose at least eight or ten days. The coal was all weighed into the ship in drafts of two hundredweight each; so any gas among the coals would have ample time to escape.
15. Dropped from the deck into the hold, a height of about 20 feet at first, gradually decreasing.
16. Fine whilst loading, and generally fine during the voyage.
17. Seemed dry all the time; were a small sized coal.
18. First indication was a smell of gas in the hold about 48 hours before the fire broke out, next smoke gradually increasing.
19. No.
20. The hold was only filled to about midway between the 'tween deck beams and the upper deck.
21. The hatches were generally opened during the day in fine weather and closed at night. No water of any consequence got down.
22. A large pit was dug in the coals where the smoke was first seen oozing out, a hole cut in the upper deck above the pit, and water poured down till the pit overflowed; we

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found water would not penetrate the coals that way, but flowed over and ran down by the ship's side.

23. None.

24. I attribute this combustion to the small coal being all in one body; the ship not having any 'tween decks to separate the cargo and want of air shafts to carry off the gas generated in the body of the coals.

"MARY SHEPHERD."

From Messrs. GILLESPY AND SCOTT, London.

1. "Mary Shepherd," A1 at Lloyd's. 10 years. 4 years old; sailing ship.
2. Autumn, 1852. In London.
3. Shanghai.
4. Spring, 1853. In China Sea.
5. Wood.
6. Believed to be tight.
7. $\frac{350}{336}$ Builder's Register.
8. Record destroyed.
9. Resolven, from Resolven Colliery—handpicked.
10. Thomas Gillespy (now deceased).
11. By wooden trunk alongside keelson, and two or three shafts to hatchways.
12. Believed to have been in the forehold.
13. Four or five months.
14. It was brought by Great Western Railway from Swansea to Bull's Bridge, near Brentford, and conveyed thence by lighters to the West India Dock, London. It was many days on the road much longer than would be the case now.
15. From lighters brought alongside. The coal was lowered into hold by baskets.
16. Wet during loading; do not know the weather during voyage.
17. Exposed to weather in transit from Swansea.
18. Hot decks, &c., for sometime before the fire.
20. Most probably not.
24. It has generally been attributed to the coal having been shipped wet, no other cause has we believe been suggested.

"ADMIRAL LYONS," "GLENLYON," "HANNAH LAW."

From CAPTAIN F. G. FRY, Liverpool.

1. "Admiral Lyons," 7 A1; about five years old, sailing ship; I was mate in this ship; "Glenlyon" under my command; "Hannah Law," I was on survey. "Glenlyon," ditto.
2. "Admiral Lyons," Sunderland, June 1861. "Glenlyon," Birkenhead, 1865. "Hannah Law," Birkenhead, 1868. "Glenlyon," Birkenhead, 1868.
3. All. Bombay.
4. "Admiral Lyons," July 1861, about 5° S. 25° W. "Glenlyon," January 1866, Aden. "Hannah Law," January 1869, Bombay Harbour. "Glenlyon" January 1869, Bombay Harbour.
5. All of pine woods.
6. None of them to any extent.
7. "Admiral Lyons," 1133. "Glenlyon," 1440.
8. "Admiral Lyons," about 1,000 tons coal, 400 tons coke; "Glenlyon," 2,050 tons, all coal.
9. "Admiral Lyons," I believe Howard's, West Hartley double screened; "Glenlyon," Westminster, Brymbo double screened; "Hannah Law," I do not know the colliery but shipped from Birkenhead.
10. "Admiral Lyons," do not remember; "Glenlyon," Messrs. Battersly.
11. "Admiral Lyons," two shafts, one each side, 4 feet from the bottom of the ship connected with shafts up each hatch; "Glenlyon," planks on the beams 4 inches apart, ventilation along each side of the keelson connected with a shaft up each hatch.
12. "Admiral Lyons" right under the main hatch about 5 feet from the keelson and close to the ventilator. "Glenlyon," right under the fore hatch, about 5 feet from the keelson and close to the ventilator.

When smoke was first seen issuing from the hold we endeavoured to find the locality of the fire, finding that the temperature in the main hold was the greatest, commenced pouring water down by means of buckets and fire engine, but finding the heat and smoke increasing rapidly, held a council, and decided upon scuttling the ship and admit sufficient water to reach the fire if possible; did so; in the mean time attached large canvas hoses to the main pumps, and kept them going down the main hatch; when the water in the hold had reached 8 feet found steam issuing up the hatchways, plugged the holes up that were made for scuttling. The heat gradually decreased when we dug down the cargo in main hatch and found the fire was entirely extinguished, it having originated about the foot of the ventilation shaft, having burnt it; also a part of the main beam. At times during the rest of the voyage, when we found the temperature of the hold increasing, we poured large quantities of water over the coals which seemed to cool them down; arrived safely in Bombay, in October 1861. "Hannah Law" and "Glenlyon" in each case when called on survey I advised the immediate flooding of the hold which was in each case successful.

13. "Admiral Lyons," 7 weeks; "Glenlyon," 22 weeks; "Hannah Law," 5 months; "Glenlyon," 6 months.
14. I do not know exactly, but I think about two days.
15. "Admiral Lyons" from a short fall about 12 feet. "Glenlyon" tips fell from 15 to 25 feet. "Glenlyon" ditto. "Hannah Law," I think tips, but not certain.
16. "Admiral Lyons," wet. Voyage mostly fine; "Glenlyon," fine loading; fine during voyage; but much calm weather.
17. "Admiral Lyons," damp; steamed a little during voyage; "Glenlyon," dry when shipped; same during voyage; but I noticed much pyrites among the coal.
18. "Admiral Lyons," noticed a little smoke coming up the ventilators a few hours only before the fire; but rapidly increased. "Glenlyon," noticed an increase in the temperature of the hold for several days before the fire.
19. "Admiral Lyons," no; "Glenlyon," every day at noon.
20. Not quite; a free passage was left between the coals and deck fore and aft in each vessel.
21. "Admiral Lyons," fore and aft hatches were kept off always during fine weather, but not the main hatch, as the long boat was stowed on the top of it. "Glenlyon," the hatches were all kept off during fine weather about two thirds of the passage; in each no water got down.
23. In each case a good fire engine, plenty of hose, and two other pumps.

"USK."

From Messrs. T. BEYNON & Co., Newport (Mon.).

1. Barque "Usk," lost 1861; built at Newport Mon., age 9 years; sailing vessel, 338 tons register.
2. Swansea, in 1861.
3. Valparaiso and a port.
4. About 200 miles south of Valparaiso.
5. Wood.
6. No, she did not make water.
7. 338.
8. About 450 tons of coal.
9. Smelting coal which was not screened.
10. I think it was Messrs. Henry Bath and Sons, Swansea.
11. In the usual manner, with wooden shafts from each hatchway.
12. It was supposed under the fore hatchway.
13. About 100 days.
14. I think it was shipped almost directly it came from the pit.
15. The ship was loaded from waggons tipped into a shute and allowed to run from thence into the ship's hold.
16. The weather was raining during the loading of the vessel.
17. The coal appeared to be damp when shipped.
18. Only a few hours previously a great heat was felt in the forecastle, and on the fore-hatches being taken off the flames burst up as high as the tops, and the ship was immediately abandoned.
19. I do not think it was.
20. The main hold was completely filled up to the hatches, but the after and fore holds were not.
21. I cannot tell.
22. There was no time to take any measures.
23. None.
24. To the cargo being shipped in a damp state, principally.

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"JOANNA," "WANDERER," "ANNIE LAURIE," "MAY QUEEN," "PALMYRA."

From Mr. WILLIAM THOMPSON, Uphall.

1. 1 "Joanna". No class. Sailing.
   2 "Wanderer." Do. Do.
   3 "Annie Laurie." Do. Do.
   4 "May Queen." A 1 Do.
   5 "Palmyra." A 1 Do.

   Nos. 1, 2, 3. August, 1864. Leith.
   „ 4. September, 1874. Newcastle.
   „ 5. June, 1874. Liverpool.
3. Nos. 1, 2, 3. Quebec.
   „ 4. Rangoon.
   „ 5. Madras.
4. Nos. 1, 2, 3. October 1864. St. Lawrence.
   „ 4. February 1875. Off Madras.
   „ 5. October 1874. Do. But Extinguished.
5. All timber.
6. No.
7. No. 1, 555 tons. No. 2, 639 tons. No. 3, 645 tons. No. 4, 1,054 tons. No. 5, 888 tons.
8. No. 1, 442 tons. No. 2, Account lost but under 500 tons. No. 3, 434 tons. No. 4, 1,340 tons. No. 5, 1,206 tons.
9. Nos. 1, 2, 3. Duke of Buccleuch. Unscreened.
   „ 4. Cowpen Hartley. Screened.
   „ 5. Lancashire Do.
10. Nos. 1, 2, 3, 4. On ship's account.
    „ 5. Madras Railway Company.
11. Nos. 1, 2, 3. Not ventilated.
    „ 4 and 5. With wood up and down each hatch.
12. Unknown.
13. Nos. 1, 2, 3. About two months.
    „ 4 and 5. About four months.
14. Nos. 1, 2, 3. I believe had been stacked at the pit head for some time.
    Nos. 4 and 5 fresh drawn.
15. All from waggon by steam crane.
    About 20 feet.
16. Unknown.
17. Unknown.
18. By smoke and strong smell of gas.
19. No.
20. In none of them.
21. Orders given to masters to open hatches only in fine weather, and believe this was attended to.
22. Unknown.
24. In cases Nos. 1, 2, 3, the quality of the coal, they were all shipped at the same time. We had carried them for two or three years previously quite safely. We have never shipped any of them since.
    Nos. 4 and 5 we cannot explain.

Captain WILLIAM RIDDOCK, of London, also sent an enclosure relative to these cases.

"LOCHIEL."

From Captain NEWTON.

1. "Lochiel," of Dundee. Sailing. About nine years old.
2. Off Tayport, 17th September 1864.
3. Calcutta.
4. 4th January 1865. Bay of Bengal.
5. Wood.
6. Tight.
7. 1,501 tons.
8. 1,500 tons.
9. Townhill colliery.
11. Partially ventilated; wood.
12. Amidships; main hatchway.
13. 3½ months.
15. Loaded by tubs from lighters.
16. Very bad while loading; coals thoroughly wet with sea and rain. Moderate during voyage.
17. Very wet.
18. Only 24 hours before. Smoke.
19. No.
20. No.
21. Off every day except a few days before the explosion when crossing Equator.
22. Battened down hatches and made for Galle; escaped in the boats.
23. Ship's pumps.
24. Wetness of the coal.

"HER ROYAL HIGHNESS."

From Messrs. CHARLES HILL AND SONS, Bristol.

1. "Her Royal Highness." A 1 eight years. New ship
2. November 1865; reshipped January 1866. Cardiff.
3. Valparaiso.
4. April 5th, 1866. Latitude 39° S., longitude 54° W. Cargo found to be in a heated state; bore up for Monte Video.
5. Wood.
6. Made some water during bad weather.
7. Gross about 1,280; net register 1,244 tons.
8. 1,804 tons.
9. "Rhonda," No. 3, through and through.
10. Henry Bath and Sons.
11. Ventilated as described in sheet No. 1.
12. The captain, on examining the cargo, found it very much heated under the main hatch, and smoke or steam issuing from it; he forced bars of iron into it as far as possible, and on withdrawing them they were found to be very hot; he feared combustion, and ran the ship back to Monte Video, which was reached in a few days, and where he sold the coals, as the expense of landing and reshipping would have been heavy.
13. Three months.
14. No means of knowing.
15. Loaded in first place from tips, and on reshipping from barrows wheeled over the hatch with a fall of about 24 feet at commencement.
16. The coals were exposed to rain after being discharged; some heavy gales were experienced during the passage.
17. See above.
18. Answered.
19. Temperature frequently taken, and by that means the tendency to combustion was discovered.
20. The cargo was pretty close up in main hatch at starting, but the hold was not full.
21. The hatches were taken off in fine weather, but no water got down.
22. Answered.
23. Answered.
24. This was a new ship and as she was very flat in the floor we placed the platform as high as we thought she would bear it to make her "sea kindly," but we put it too high, and in getting down channel she would not stand up to her canvas, and had to be put back; we discharged a large portion of the coals and took up the platform for a length of 50 or 60 feet, and let the coals run down on to the skin and then reshipped the portion that had been landed; I attribute the accident to the coals having got damp before reshipping, and the platform having been removed from the bottom of the ship so that there was no air or ventilation under the midship portion of the cargo.

"ROYAL FAMILY."

From CAPTAIN WILLIAM BUCHANAN.

1. "Royal Family," sailing vessel, run five years without being classed, and was then classed five years. Was about six years old at time referred to.
2. Birkenhead, February 1868.
3. Aden.
4. Latitude 35° S., longitude 5° W., 72 days out from Liverpool.
5. Wood.
6. Tight but had encountered very severe weather.
7. Net tonnage register 1,750.
8. About 2,500 tons.
9. Welsh steam, shipped at Birkenhead, single screened.
10. P. and O. Steamship Co.
11. Platform, open ended with jelise ventilator in main hatch of wood, (this ventilator which was all broken below I considered as the cause of heating.)
12. About 14 feet from deck in main hatch.
13. About 80 days.
14. Unknown.
15. Wheeled on board.
16. Rainy weather in loading variable.
17. Damp when put on board, ship tight during voyage.
18. Hatches taken off every opportunily.
19. Once a week driving down iron rods in each hatchway.

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20. Main hatch, yes. Ends, no.
21. Water got into the hold only through ventilator in main hatchway.
22. Found that after leaving iron rods in hatches four hours drew them up when they were so hot that they singed the hands. At once dug down to a depth of 14 feet and allowed the air to get at the heated coal.
23. Head and portable force pumps with hose.
24. Ventilator in main hatch being broken below (when loading) while end above remained open, allowing any water which might find an entrance to spread (or lodge) in the coals.

"PERSIA."

From Mr. J. H. WATT, Glasgow.

1. "Persia." Sailing ship, 1,290 tons. Built at Quebec, 1864. Seven years A 1.
2. Sailed from Greenock, 1st September 1868.
3. Bombay.
4. Off Cape of Good Hope, 31st October 1868.
5. Wood.
6. None.
7. Net register 1,290 tons; gross 1,331 tons.
8. 1,830 tons coal.
9. Wishaw coals. Lanarkshire. Single screened.
11. Ventilated with wood fore and aft.
12. Under the poop.
13. About 60 days.
14. Brought direct from the pits to the ship.
15. Loaded with six tons waggon, put on board by engine power, and might fall about 12 feet.
16. Weather was showery.
17. Coal was dry.
18. Heat was experienced in the poop, then in a few days smoke was seen, which increased, until decks were burning; this was followed by a violent explosion, the ship was wrapped in flame and then abandoned.
19. Not that I am aware of.
20. No.
21. I have no knowledge. Ship was tight and no water came on board.
22 Hatches were secured to cut off air, but the final destruction was very rapid.
23. Hand engine with long hose.
24. I cannot give any reason.

"JANET COWAN."

From Mr. JAMES CUTHBERT, Greenock.

1. "Janet Cowan," A, three years sailing.
2. August 1869, Greenock.
3. Bombay.
4. 1st. November 7th, latitude 34° 52′ S., longitude 59° 53′ E.; 2nd. November 21st, latitude 29° 26′ S., longitude 69° 5′ E.; 3rd. December 11th, latitude 12° 58′ N., longitude 70° 16′ E.
5. Iron.
6. She made no water.
7. 1,277 $\frac{70}{100}$.
8. 1,756.
9. Cannot say.
10. J. and R. Young, Buchanan Street, Glasgow charterers.
11. Three ventilators, one in main hatchway, one in quarter hatch, one in ventilator on top of house on deck, of 9-inch deals, with 2½-inch space.
12. In the hatchways.
13. From August till above datea.
14. Cannot say.
15. From Crane by waggon, about 25 feet at the commencement, or about three feet from hatch coomings.
16. Wet for the first 300 tons or so, dry for remainder; fine till within a week of the fire.
17. Seemed to be dry.
18. November 7th, 1869, latitude at noon, 34° 52′ S., longitude 59° 53′ E. Moderate breeze from S.W. at 4 a.m. Saw smoke coming up the quarter hatch, went below and found the hole full of smoke; took off the main hatches and saw the yellow smoke issuing up from among the coals; commenced to get the coals on deck, when up to the rail both sides put them overboard by 11 a.m., was at the 'tween deck beams; the coals were very hot, the smoke yellow and stifling; got on the force pump and played water on the coals in the hatchway, and kept taking them up at the same time; 1 p.m. opened three of the side ports and let the water in as the ship rolled; supposed the fire to be at the bottom. 4 p.m., closed them at 6.30 p.m., no smoke to be seen; kept the pump at work till 7 p.m.; 2 feet 5 inches of water in the pump well; put on all hatches and stopped all ventilation, also main mast-head; covered it as the smoke was coming up it like a funnel during the day, but none at the foremast.

November 8th, lat. 32° 20′ S., long. 61° 50′ E., wind westerly, moderate breeze and cloudy weather, heavy swell from the westward; at daybreak took off the hatches, a great quantity of steam in it and very hot, the coals smoking; put on the force-pump, put planks against the stanchions to keep the coals from falling from between deck, got more coals up. 2 p.m. Got to the coals that were on fire, which had been watered out. 5 p.m. No smoke or steam, kept the pump going till 7 p.m.; cloudy and gloomy looking to the westward; put the coals that were on deck overboard. 8 p.m. Commence pumping the ship out, kept off all hatches, and open all ventilators.

November 9th, lat. 31° 2′ S., long. 62° 31′ E., wind N.N.W., light breeze and cloudy, no smoke to be seen in the hole; dug down in the coals 9 feet from the 'tween-decks, the coals were hot, but no appearance of fire.

November 10th, lat. 29° 26′ S., long. 65° 58′ E. No fire or smoke to be seen in the hole; dug down into the coals, all felt cool, put in another ventilator in the after part of the hatch, no appearance of smoke or steam until the 21st.

November 21st, lat. 8° 32′ S., long. 69° 5′ E. Light variable winds and calms; 2 a.m. smoke was seen coming up the quarter hatch ventilator; commence to get the coals up, put them in the main hatch and on deck; 5 a.m., down as far as between decks, coals hot, smoke suffocating, which caused some of the crew and myself to vomit, and made them unable to proceed with work for a time; was then only able to fill three beef casks and be relieved by others, the force pump at work, taking the coals up at the same time; by noon down 7 feet below 'tweendecks, no smoke to be seen; kept all hatches and ventilators open.

November 22nd, lat. 7° 13′ S., long. 69° E. Light variable winds, no smoke, coals hot, got some more on deck; dug down 10 feet from between decks, saw steam but no smoke, put another ventilator in the fore part of the hatchway.

November 23rd, lat. 6° 32′ S., long. 69° 07′ E. Light breeze from the westward, took some more on deck as they felt hot, kept the pump at work for about an hour when all felt cool.

December 11th, lat. 12° 58′ N., long 70° 16′ E. Fine weather 7 a.m.; smoke was seen coming up the forehatch; trimmed the coals in between decks aft, got them up from lower hold and put them in between decks; by noon got to the coals that was burning kept the force pump at work for about an hour when all felt cool.

December 12th. No appearance of fire.

19. Not until after the first fire, but was tried after by thermometers.
20. In the main it was, but could crawl fore and aft the ship in the wings.
21. Always open only in bad or wet weather. No water got down.
22. Perseverance to get to the place that was on fire, and would do the same again if ever it was my lot to be in the same predicament, but will be glad to hear of some improvement.
23. Force pump with hose.
24. To the dust left in the wake of the hatches and a current of air could not get through amongst them. I would propose to have large ventilators that a man could get down and clear the dust or small coal with a rod of iron and take the dust and coal out of it to the bottom of the ship, also a small ventilator fore and aft in the body of the coals to be led to the main ones.

Mr. WILLIAM BUCHANAN, of Greenock, also sent an enclosure relative to this case, and states in reply to questions No.

9. Splint coal from Messrs. Scott and Gilmours' Collieries Wishaw district, screened at pit but don't know whether double or single.
24. Some mineral defect in the coal as many vessels loaded from same pits took fire.

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"SERENA." *

From Captain GEORGE SYMONS, Swansea.

1. "Serena," 16 A1; three years sailing.
2. Swansea, October 1869.
3. Valparaiso, but put into Rio de Janeiro.
4. Indication of fire off Madeira. Put into Rio December 5. Condemned and sold the cargo. A crew kept employed throwing water on it for the purpose of working it out.
5. Wood and iron.
6. No.
7. 493 tons.
8. About 720.
11. Yes, as previously mentioned; yellow pine planks.
12. An intense heat all over the hold, and stunk of sulphur. Am certain, another week and it would have been all fire.
13. From October 20 to December 6.
14. Cant say.
15. From wagons, 40 feet fall.
16. Very fine.
17. Dry throughout.
18. Actual fire did not break out; a few days more was only required. Indication, top of cargo quite green, similar to metals calcined, and smell exactly same (suffocating); had to live on deck for some days previous to entering Rio.—Much slate in this coal; when discharging it came out white with heat, and smelt strong of sulphur. I think this slate in cargoes highly dangerous.
19. Frequently with them.
20. No. Could walk and crawl over it.
21. Hatches daily open. Water was thrown down, the day I bore up for Rio, for the purpose to cool it.
22. Turning it over and over, and ultimately jettisoned a portion.
23. None. Pump.
24. Veins of sulphur in more or less of the coal, and slate as above. A coal owner once told me there are veins in mines or pits that should not be mixed with coal for long voyages; but the colliers will do it if not watched. No doubt there is something in this. *Memo.*—Last February I was at F. Isles—(went out about the "Alpha"),—and in Stanley there were five ships with different kind of coals on board. All put in with coals on fire. Cargoes ventilated in the usual way. Two of my voyages exceeded four months. A full cargo of coals, and not ventilated, turned out cool and in good order. Consequently I think it's a spontaneous vein in and about some pits that will ignite when in a heap of some tons, whether ventilated or any other precaution used. (I allude to the Swansea copper ore fitted ships in ventilation, which is evidently the best plan.)

"GLARAMARA."

From Messrs. JOHN BRYMNER & Co., Greenock.

1. "Glaramara," about 13 years A 1, sailing.
2. Greenock, May, 1870.
3. Matanzas.
4. Off Cuban Coast, July 1870.
5. Wood.
6. Tight ship.
7. 475 $\frac{55}{100}$, and 449 $\frac{55}{100}$.
8. 660 tons.
9. Wishaw Main coal.
10. John Brymner & Co.
11. Partially with wood.
12. Apparently in forehold.
13. About 60 days.
14. Believed to be fresh dug.
15. Partly by hand, partly by drop of from 8 to 10 feet.
16. Fine weather during loading, apparently the same during voyage.
17. Dry.
18. Slight smoke shown for two days before fire broke out.
19. Cannot tell.
20. No.
21. Have no information.
22. Water poured down the hatches.
23. None.
24. Captain could not suggest any reason; informed us he had taken every precaution; except day after fire was seen when there was a violent squall, with rain, &c.

* A subsequent case of combustion appears to have occurred in this vessel in 1870 under very similar circumstances.

"VANDA."

From Messrs. STODDART BROTHERS, Liverpool.

1. "Vanda," A1 at Lloyd's; age five years. Sailing ship.
2. Shields; River Tyne, May 1870.
3. Calcutta.
4. Near Cape of Good Hope. Was abandoned on fire 28th July 1870.
5. Wood.
6. None.
7. 1,081 under deck. 1,141 gross.
8. 930 tons; remainder of cargo was 560 tons coke, and 11 tons bricks.
9. Do not know.
10. Alfred Turner, esquire, Liverpool.
11. Do not think there was any special arrangement for ventilation. Captain instructed to keep hatches off when opportunity offered,
12. Cannot say.
13. A little over two months.
14. Do not know; perhaps 12 to 18 hours.
15. Loaded from waggons by spouts; cannot say the height.
16. Do not know.
17. Do not know.
18. Cannot give particulars. Captain at sea; letters put away.
19. Cannot say.
20. Coal and bricks in lower hold and coke in 'tween decks.
21. Cannot say.
22. Cannot say.
23. Fire engine.
24. Cannot name any particular cause.

"MALABAR."

From Captain J. GALLOWAY.

1. "Malabar," A 1, two years; sailing.
2. June 1870, London.
3. Batavia, Java.
4. July 25th, 1870; 29° S. latitude; 30° W. longitude.
5. Iron frame and iron-plated.
6. Quite tight.
7. 1,200 register.
8. 1,274 tons 14 cwt.
9. Langley Mill.
10. On ship's account.
11. Yes; horizontally on each side of keelson, and perpendicularly at each hatchway.
12. Main hatch.
13. Thirty-six days.
15. By hand-basket from coal barges.
16. Dry weather and fine weather till discovering fire.
17. A portion taken in wet from leaking in barges, but no water afterwards got near them.
18. No indication until the smoke was discovered.
19. Not taken.
20. No, only two thirds cargo on board.
21. Hatches constantly open, and no water got down.
22. When we observed smoke threw about 50 tons overboard, and worked force pumps for two days until compelled to close hatches.
23. Only the two force pumps.
24. Bad quality of coal and damp condition.

"L'AGOUHANNA."

From CAPTAIN WILLIAM KENNEDY.

1. "L'Agouhanna" S A1 five years old, sailing.
2. About 10th October 1870, Birkenhead.
3. Bombay.
4. About 25th January 1870, about 500 miles S.S.W. from Bombay.
5. Wood.
6. Ship tight.
7. Net 1,103, gross 1,130.
8. 1,600 tons.
9. This information to be had from Messrs. W. H. Ross & Co., Liverpool.
10. Refer to Messrs. W. H. Ross & Co.
11. Yes, explained in clause 4 other sheet, wood.
12. About mainmast.
13. About three and a half months.

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15. By waggon, coal fell about 20 feet to hatch coomings.
16. Showery.
17. Damp when shipped.
18. Yes, by quantity of steam rising from hold about three days before fire occurred.
19. Once a week by thermometer; found very little difference in temperature till fire appeared.
20. No.
21. Hatches open at all convenient seasons, no water ever got down.
22. Applied force pumps.
23. Force pumps.
24. To the height coals fell into the hold.

"CEREAL."

From Messrs. HINE BROTHERS, Maryport.

1. "Cereal." A1. 13 years old. Sailing ship.
2. August 7th, 1872, Swansea.
3. Santos.
4. September 28th, 1872. 4–30 S. 27–30 W.
5. Wood.
6. Made no water.
7. 299 gross. No nett.
8. 488.
9. Half, Merthyr Dare Colliery, and the other half, Gravesend and Gellia Cadoxton Collieries. Double screened. Cannot tell which seams.
10. J. S. de Vasconcellos & Co., London and Liverpool.
11. Not ventilated.
12. In the centre.
13. 60 days.
14. Fresh wrought.
15. Loaded from spout, the outer end of which to the hatchway was about five feet.
16. Rained all the time of loading. Fine weather until she took fire.
17. Wet.
18. Felt heat about week before fire broke out. No smoke until the day before flames broke out.
19. No.
20. Not nearly so; three feet from main hatch, five feet from fore and after hatches, and both ends of the ship empty.
21. Open all the time and no water ever got down.
22. Captain never expected ship was on fire until day before flames broke out. Time occupied in preparing and provisioning boats which was just accomplished in time Bore away from Pernambuco in hopes of scuttling ship there.
23. No special appliances.
24. Probably on account of being fresh wrought and shipped in a wet condition, combined with perhaps the fiery nature of the coals. This latter is only a surmise.

"BIVOUAC."

From Mr. WILLIAM LAING.

1. "Bivouac," 20 years in Red, in Liverpool book, built in 1871, steam.
2. Sailed 23rd October 1872 from Newcastle-on-Tyne.
3. Odessa.
4. Between Gibraltar and Malta beginning of November 1872.
5. Iron.
6. None.
7. At that time $\frac{1125}{731}$ gross nett, now $\frac{1125}{725}$ gross nett.
8. 1,229 tons cargo.
9. Not known.
10. George Pyman & Co.
11. Yes, with galvanized iron cowled ventilators, two to each hold or compartment.
12. Main hold.
13. About ten days.
14. Not known.
15. By a staith or spout in the Northumberland Dock. Height not known.
16. Wet at time of loading.
17. Wet when put on board.
18. A light steam was seen a day before the fire broke out, but was supposed to be caused by the moisture evaporating.
19. No.
20. Not known, but very improbable, she being a three-decked ship.
21. As far as I know, hatches were never open, as weather was bad.
22. The cargo was carefully watched, and when it was noticed to be burning, holes were cut in the deck, and the ship's pumps brought to bear with the fire-hose inserted, which very shortly extinguished it.
23. Nothing special beyond the ordinary fire-hose attached to the engine pumps.
24. The wetness of the coals through being shipped at a time when heavy rains prevailed, and possibly aggravated by proximity to boiler bulkhead, which, however, was properly sheathed.

"HENRY BATH," "ALPHA."

From Captain A. PEARE, Swansea.

1. "Henry Bath" and "Alpha," both sailing ships, A1 13 years, "Alpha" built 1863, "Henry Bath" 1864.
2. "Henry Bath," December 1872, at Swansea; "Alpha," July 1874, at Swansea.
3. Chili, West Coast of South America.
4. Off Cape Horn in both cases, about 70 days after sailing.
5. Wood.
6. Very little.
7. "Henry Bath," 486 register, 680 gross; "Alpha," 390 register, 560 gross.
8. 650 and 650.
9. Smelting coal, Mynyddy Bach.
10. Henry Bath and Son.
11. Planks on each side of stanchions from the keelson to the upper deck beams.
12. "Alpha," under fore hatchway; "Henry Bath," between fore and main hatchway.
13. About 70 days.
14. A short time.
15. "Henry Bath" loaded with boxes, lowered down to main hatchway before tipping; "Alpha" from spout or shoot that came down to the hatch.
16. Wet weather in both cases.
17. Wet when shipped.
18. Found the cargo getting heated, threw some overboard, and turned over as much as possible of the remainder.
19. Occasionally.
20. Filled up in the main hatch, not in the wake of fore and after ones.
21. Booby hatch aft nearly always open.
22. As mentioned above, and in the "Alpha" case pumped water into hold when the heat increased.
23. Pump.
24. The coal being small and wet.

"COUNTY OF NAIRN," "COUNTY OF PERTH."

From Messrs. R. & J. CRAIG.

1. Sailing ships, "County of Nairn," 16 years A1, three years old; "County of Perth," new 100A.
2. "County of Nairn" finished loading 3rd May 1873; "County of Perth" finished loading 4th July 1874.
3. "County of Nairn," Java; "County of Perth," Calcutta.
4. "County of Nairn," near Sourabaja; "County of Perth," near the entrance to the Hoogly.
5. "County of Nairn," composite; "County of Perth," iron.
6. Both ships were perfectly tight and had not at any time made water.
7. "County of Nairn," 1,047 gross, 999 nett; "County of Perth," 1,696 gross, 1,626 nett.
8. "County of Nairn," 600 tons; "County of Perth" 1,600 tons.
9. "County of Nairn," Hamilton Coal Company; "County of Perth," Roughrigg coal; both double screened.
10. "County of Nairn," James Finlay & Co.; "County of Perth," The Queen Steam Ship Company.
11. "County of Nairn," eight 12-inch ventilators and one 21-inch, of iron, all through main deck, and three iron mast ventilators; "County of Perth," one 28-inch wood from main deck to bottom of hold, with iron bell-mouth, and ten 12-inch of iron through main deck, and three iron mast ventilators.

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12. "County of Nairn," combustion took place in main hatch, lower hold; "County of Perth," combustion took place near the main hatch, in lower hold.
13. "County of Nairn," 110 days; "County of Perth," 114 days.
14. Direct out of the pits in the case of both ships.
15. Coals carted alongside of the ships and wheeled on board. The fall from planks to bottom of hold would be for "County of Nairn" 24 feet, and "County of Perth" 27 feet.
16. Fine dry weather during both loading and voyage.
17. Apparently dry when shipped and during voyage.
18. No indication of heating observed in either case, but a smell of gas was observed the evening before the fire broke out in the "County of Perth."
19. We are not aware whether the temperature of the hold was noticed during the voyage.
20. "County of Nairn," four-fifths of lower hold to a height of three feet; "County of Perth," about four-fifths of lower hold, from ceiling to a height of 7 to 8 feet, and about one-third of 'tween decks to a height of 3 feet.
21. "County of Nairn," hatches off nearly the whole voyage, and while discharging in Batavia; "County of Perth," the hatches were off nearly all the voyage till the evening before the fire, when they were put on in consequence of heavy rain; no water got down.
22. Fire hose from both pumps playing on the coal.
23. No other appliances but the fire hose and pumps.
24. Cannot attribute any cause for the spontaneous combustion.

"PERSIA."

From Mr. George Duncan.

1. "Persia," A1 9 years, built in 1853 (almost rebuilt in London, 1865).
2. Cardiff, 15th May 1873.
3. Aden.
4. Aden, 4th September 1873.
5. Wood.
6. None.
7. 1,704 net, 1,806 gross.
8. 2,087 tons.
9. Insoles Merthyr Steam for the Peninsular and Oriental Company.
10. Insole and Sons.
11. Same as stated in the "Indian Empire's" case.
12. In the way of the fore hatch near the bottom.
13. 112 days.
14. Cannot say.
15. Loaded from waggon which came very near the hatchway.
16. Good weather and favourable voyage.
17. Cannot say.
18. No; found on fire when discharging.
19. No.
20. No.
21. It is a standing order for hatches to be off during good weather. Believe no water went down.
22. Fire extinguished by aid of ships' fire engine hose. Ceiling was little charred.
23. Fire engine and head pump.
24. Cannot say.

"PRINCE ALFRED."

From Mr. Gates, Shoreham.

1. "Prince Alfred" (barque). Totally lost; burnt through combustion. Sailing vessel.
2. June 1873. Hull.
3. Galle.
4. Indian Ocean. Will obtain date, but think in August 1873.
5. Wood.
6. No, quite tight.
8. About 600.
9. I am unable to give the name at present.
10. I will find out, but cannot say now.
11. I believe it was not ventilated.
12. I believe the fore part.
13. I think between two and three months.
14. I cannot say, but understood they were shipped immediately.
15. I cannot say how great a fall.
16. I believe dry and warm.
17. I believe dry.
18. Yes, for some days before.
19. I cannot say, but believe not.
20. No.
21. I am not able to say, but believe water was thrown into the hold.
22. Hatches were battened down, but fire burst through deck.
23. No other than buckets.
24. Ignition of timber through combustion.

I shall be glad if I can in any way give information, but think the captain would be able to give more valuable information.

"CHANNEL LIGHT."

From Mr. Charles Beades, Lancaster.

1. "Channel Light," sailing, 6 years, and reclassed in August 1873 for six years.
2. Hull.
3. Rio.
4. Rio, October 1873.
5. Hackmatack, &c.
6. No.
7. 553 tons.
8. About 750 tons.
9. Do not know the name of the colliery.
10. Messrs. Wilson & Sons, 57, Great Church Street, London.
11. Yes, iron and wood.
12. Hold.
13. From 15th August to October 1873.
14. Short time only.
15. Tips trunk resting upon the deck.
16. Fine.
17. Dry.
18. No indication until after arrival at Rio.
19. Do not know.
20. No.
21. Do not know.
22. Ship moved into deep water and steam pumps used. Ship scuttled.
23. Force pump and hose.
24. Coal not laying long enough before shipment to let the gases escape.

"GEORGE DOUTHWAITE."

From Mr. Ralph Curry, Sunderland.

1. "George Douthwaite," built in 1860 at Blyth, Northumberland, 9 years A1, and continued.
2. 12th July 1873, Hull.
3. Constantinople.
4. First indications of combustion 6th September.
5. English oak frame, Stettin oak floors, planking inside and out, Danzig and Stettin oak, and American elm decks, Quebec yellow pine.
6. Ship quite tight.
7. 362 nett.
8. 626.
9. Reported as from South and West Yorkshire pits, double screened.
10. Cory Bros., of Cardiff.
12. Evidently amidships as main hatches blew off.
13. About two months.
14. Seven to 10 days out of pits before shipment.
16. Raining incessantly.
17. Wet decidedly.
18. By stilt and smoke first.
20. Main hatch, but not fore and after hatches.
21. After hatch would be open several times during voyage, as certain stores were in it on the cargo, lives, &c. No water would get down to the best of my knowledge.
22. According to captain's letter it seems to have been his intention to put the ship where she could be scuttled, and I fancy was afraid to take off main hatches for fear of giving free vent to fire.

The following is an extract from captain's letter:—

"I could do nothing else but put in here, she got worse every day; all hands were nearly suffocated with the smoke and dreadful stith; I bore up on Sunday night at 8 o'clock for this place, 11 o'clock at night she blew the hatches off, and sent sheets of flame up to the height of the main top. The wind came down the bay in the morning, so I had to beat up fresh breeze that set her going fast; the yellow smoke came rolling out like out of a steamer's funnel; as soon as we got in the entrance the men-of-war sent their

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boats with force pumps and played on the coals. Harbour master sent a steamer to tow her in. Put her into 18 feet water and scuttled her directly. The Greek men-of-war men and officers stopped on board all night to fill her up. An Italian frigate, a Russian gun-boat, and a Greek iron-clad are here, they all sent their assistance, about 50 hands on board us every day; commenced to pump her out yesterday afternoon; I shall hold survey to-morrow morning; cargo will have to be discharged, stores and spare sails all condemned in the Lazarette; could not get them up when we wanted, being full of smoke. Lloyd's agent intends to come to-morrow from Patras. The acting consul here told me to ask you to communicate with the Ionian Bank, London, about the money required here, &c."

23. No.

24. Think wet state of cargo when shipped.

"ST. MUNGO.",

From Messrs. GILMOUR & Co., London.

1. Sailing ship, "St. Mungo," built 1865, *A1.
2. Dundee, June 1873.
3. Point de Galle.
4. 13th September 1873, latitude 34° 57′ South, longitude 20° 18′ West.
5. Iron.
6. Perfectly tight.
7. 1,375 and 1,299 tons.
8. About 1,700 tons.
9. Townhill Colliery, steam coal, double screened.
10. Duncan Mitchell & Co.
11. Ship had 9 ventilators, fixtures, besides plank ventilators to all the hatches.
12. Aft, under poop.
13. Nearly three months.
14. Taken straight from the pit to ship.
15. From waggon, 10 to 20 feet.
16. Fine dry weather; very fair at sea.
17. Very dry.
18. Smoke seen on the 13th September, and she was abandoned 14th September.
19. Frequently.
20. There was a very large vacant space.
21. Nearly all the time.
22. Battened down to stop all draft.
23. Fire engine, &c.
24. Coal coming fresh out of pit.

"WALTER BAINE."

From Mr. J. S. GRIEVE.

1. "Walter Baine," AA1, 5 years, old sailing vessel.
2. Dundee, 8th July 1873.
3. Calcutta.
4. 27th September 1873, 39° 22′ S., 73° 19′ E.
5. Iron.
6. Never made water.
7. 898 tons nett, about 940 gross.
8. 1,170.
9. Spence's Wishaw Ell coal (Larkhalls district), single screened.
10. Baine & Johnston, Greenock.
11. Through ventilated; white pine was down the hatches and connected through along keelson.
12. Main hatch.
13. 81 days.
14. A few days.
15. From waggon; cannot say the height.
16. Very wet at time of loading.
17. Wet.
18. Refer to book by Rundell on Spontaneous Combustion on Coal Cargoes, page 46.
19. Not that I am aware of. Captain not in my employ now.
20. The bulk of coal was in the body of the ship, but not nearly loaded.
21. Cannot tell; believe no water ever got into the hold.
22. See Rundell's book, page 46.
23. Do.
24. I have a strong opinion the wet condition of the coal had a great deal to do with this case, and I do not approve of ventilators. I sent a new ship some months ago from Greenock, with 1,800 tons coal, and took care to ship only in dry weather; she arrived all right, after 120 days' passage. Another sister ship soon after was loaded with 500 tons coal and general cargo, for San Francisco, shipped in dry condition. She had 139 days' passage; arrived all right.

"ISABELLA KERR."

From Messrs. JOHN KERR & Co., Greenock.

1. "Isabella Kerr," 14 years A1, 9 years old, sailing.
2. August, at Dundee.
3. Calcutta.
4. 25th September, 32° 58′ S., 28° 28′ W.
5. Iron and wood.
6. Some water got in by side light, to which cause we attribute the fire.
7. 1,416 tons nett.
8. 1,955 tons.
9. Ell coal from Lanarkshire pits.
10. Ourselves.
11. Yes; wooden ventilator up each hatch and one along keelson.
12. After hatch, fore and aft in 'tween decks.
13. About seven weeks.
14. Cannot say.
15. From waggon at Dundee crane.
16. Wet during loading.
18. Captain found great heat coming up after-hatch ventilator five days before smoke came up.
19. No.
20. No.
21. Hatches kept open during fine weather; no water got down.
22. Heated coals were thrown overboard, and ship ran for St. Helena.
23. Force pump.
24. Water getting in through side light.

"ARRACAN."

From Captain C. S. CAIRD, Greenock.

1. "Arracan," sailing, 12 years, A1, A.M., 11 years old.
2. Cowpen coals; Howden dock, September 10th, 1873; North Shields.
3. Bombay.
4. February 16th, 1874; latitude 3° 40′ N., longitude 67° E.
5. Oak, Hackmatack, and pitch pine, all copper fastened.
6. Half an inch per hour.
7. 1,010 and 1,040 tons.
8. 1,441.
9. Cowpen coals.
10. Joseph Fothergill.
11. Six openings of two planks from beam to beam in between decks for the lower hold, two built ventilators in the house each end for the deck, and two hatches, one each end.
12. Supposed to be about fore rigging, starboard side, below the betwixt deck.
13. Five months and seven days.
14. Can't tell.
15. Waggon, 27 feet run, 26 feet fall (60 to 70 feet).
16. Fair; fair and rain.
17. Dry; dry during voyage.
18. Smell rising and hot in the fore hold on 14th February 1874; battened down. 16th; she fired two days.
19. Felt heat forward four months out.
20. Ship very open in the hold; could crawl fore and aft.
21. Half of the voyage; no water known to go down.
22. Battened down; three times burst open; drown out by water.
23. Two pumps for deck cleaning.
24. Damp in the small coal in the hatchway.

"INDIAN EMPIRE.

From Mr. GEORGE DUNCAN.

1. "Indian Empire," *A1, built 1865, sailing ship.
2. Shields, 27th September 1873.
3. Bombay, calling at Galle.
4. Off Cochin, 11th January 1874.
5. Iron.
6. None.
7. 1,515 nett.
8. 1,977.

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9. Howard's West Hartley, best quality, steam, double screened.
10. J. R. Liddell.
11. Longitudinal shaft on each side keelson, and upshafts connected therewith coming up out of each hatchway.
12. About 8 feet aft the quarter hatch, in lower hold.
13. 102 days.
14. Cannot say.
15. Loaded at a spout in Northumberland dock, Tyne; ran down spout about 20 feet long.
16. Nothing particular as to wet while loading; fine during voyage.
17. Cannot say; believed in ordinary state.
18. Warmth felt in ventilators on deck three days previously, and subsequently a yellow smoke came up shafts.
19. No.
20. No; a considerable space in 'tween decks and at the ends of ship.
21. It is a standing order for hatches to be off during good weather; believe no water went down.
22. Hatches battened down till fire burst out; then ship was beached and scuttled.
23. Fire engine and head pump.
24. Coals shipped too soon after being dug, and not sufficiently screened.

"MOORESFOOT."

From Messrs. W. & R. Wright.

1. "Mooresfoot," A1, 10 years, sailing.
2. December 1873, Shields.
3. Bombay.
4. 10th March 1874; latitude 27° 30′ S., longitude 73° 30′ E.
5. Iron.
6. Perfectly tight.
7. 1,183.
8. 1,664 tons 4 cwt.
9. Howard's West Hartley.
10. Livingston, Briggs, & Co.
11. Ventilated by venetianed shafts up each hatch and along each side of her large box keelson; wood.
12. Supposed to be aft.
13. Three months.
14. Unknown.
15. By tip; height of fall unknown.
16. Unknown.
17. Unknown.
18. "Something was discovered coming up the fore hatch "at times having the appearance of smoke and accom-"panied by a strong smell of gas." As quoted.
19. Unknown.
20. No.
21. The captain has left no record.
22. Dug into the cargo to find out the seat of fire, battened down hatches, and closed ventilators.
23. Fire engine, hose, and buckets.
24. Have no idea.

"JOHN."

From Captain John Frostick.

1. Barque "John" sailing vessel A1, age 13 years.
2. September 12th, 1873, Porthcawl.
3. Valparaiso.
4. Seventy miles south from Cape Horn.
5. Wood.
6. No.
7. 367.
8. 564.
9. Abbw Smelting Coal unscreened.
10. Henry Bath & Sons of Swansea.
11. Hold ventilated with two half-inch boards on each side of stanchions from main keelson to deck beams.
12. In after hold.
13. 102 days.
14. About 24 hours.
15. Waggon. I should think the coals had to fall 30 feet.
16. Very wet, fine until off Cape Horn.
17. In after hold very wet, in fore hold moderate.
18. By gas and smoke in forecastle 60 hours before the flames burst through all.
20. No quite.
21. Every day when the weather was fine enough. No water got down.
22. All combustible matter taken on deck; all hatches battened down; four feet of water let into hold and ship put before the wind for the nearest port.
23. None.
24. The cargo being put on board in a wet state.

"ANNA."

From Captain P. F. Van Overklift.

1. "Anna" of Rotterdam first-class 12 years old sailing ship.
2. Cardiff, May 2nd, 1874.
3. Singapore.
4. 1st July 1874. 37° 14′ lat. S., 21° 25′ long. E.
5. Wood.
6. None.
7. 969 register tons.
8. 1,420 tons.
9. Insole's Merthyr steam coals, double screened.
10. Hypolite Worms, Esq., Cardiff.
11. Yes, with wooden pipes along the keelson and vertical ones in each hatchway (3). Two others from main deck to 'tween decks. Hatchway kept constantly open except during rainy or bad weather.
12. First about 9 feet down from surface of coals in the main hatchway. Afterwards about 15 feet from the deck or three feet from the bottom.
13. About 60 days.
14. Cannot say.
15. From waggons; there was but little fall for the coals.
16. Very fine and dry.
17. Coal appeared dry and was very dusty.
18. There was no fire but the coal became gradually very hot; temperature on deck 55° Farenheit, below 110° Farenheit.
19. Yes, twice daily every time the temperature was higher. An iron bar was forced down among the coal, this became so hot as to blister the hand when withdrawn.
20. No; forward and aft there was much space, in the middle of the ship the coal reached nearly to the decks.
21. Hatches open nearly all the voyage, only closed for rain or bad weather, hatchway in cabin always open.
22. I threw overboard about 300 tons of coal 38° S. lat. 1 East long. twenty days after (20) in 33° S. long. 78° E. long.; bad weather caused the closing of the hatchways for everal days during the time; the coal heated again but radually cooled down.
23. A force pump complete with hose always ready for use but not required.
24. To the peculiar character of the coal; I have carried coals several tons before but never met with a similar case.

"EUXINE."

From Mr. E. Bates.

1. "Euxine," iron sailing vessel A1 20 years, built 1847, rebuilt by Laird 1869.
2. Loaded Newcastle, 12 June 1874.
3. Aden.
4. Abandoned on fire, 8th August 1874, about 1,500 miles south of St. Helena.
5. Iron.
6. None.
7. 1,594 tons.
8. 2,061¾ tons.
9. Howard's West Hartley.
10. Livingston, Briggs & Co.
11. Wooden additional ventilation. Iron permanent ventilation.
12. Supposed main-hold under main-hatch.
13. A few days over two months.
14. Unknown; believed a short time, waggons coming direct from pit.
15. Tipped along a shoot into the hold.
16. Fine.
17. Unknown.
18. In gale, 1st August, coals had shifted; while crew were engaged trimming, found great heat about main hatch; 4th Aug. ship trimmed upright; 5th Aug. coals smelling strong of gas, and smoke coming up main hatch.
19. Not known.
20. No, a space under each of three decks for ventilation, and on upper deck but little coal stowed.
22. Water pumped into hold continuously after fire discovered; 50 tons hot coals thrown overboard; coals afterwards so hot, hatches battened down; 6th Aug. hatches blew off; gas and smoke coming up ventilators.

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"OLIVER CROMWELL," "CALCUTTA."

From Mr. Wm. R. Price, London.

1. "Oliver Cromwell" and "Calcutta," both colonial-built sailing ships, 1,112 tons and 1,372 tons nett register respectively, aged respectively eight and 10 years, both A1 at Lloyd's.
2. "Oliver Cromwell" sailed 18th June 1874. "Calcutta" sailed 2nd July 1874, both loaded at South Shields.
3. Of both, Aden.
4. "Oliver Cromwell," 6th September 1874, lat. 37° S., long. 14° E. "Calcutta," 17th September 1874,. lat. 35° S., long. 7° E.
5. Both ships constructed of wood.
6. Both vessels were perfectly watertight, and made no water.
7. "Calcutta" (under deck), 1,261 tons, gross 1,372 tons. "Oliver Cromwell" (under deck), 1,013 tons, gross, 1,112 tons.
8. "Calcutta," 1,802 tons, "Oliver Cromwell," 1,616 tons.
9. B/L stated coal to be Howard's West Hartley. Cannot give any information as to the seam or whether double or single screen.
10. Charterers of ships were Messrs. Livingstone, Briggs, & Co. on account of the Peninsular and Oriental Company.
11. Mode of ventilation described in clause 3. Material wood.
12. Fire in each case found to be in lower hold under main hatch.
13. About 85 and 82 days respectively.
14. Cannot say positively, but believe it was fresh from the pit.
15. By tips in Northumberland Dock, South Shields. Cannot state exact height, but it was considerable.
16. Fine.
17. What I saw on board the "Oliver Cromwell" was quite dry.
18. Please refer to clause 2.
19. The temperature was not, I believe, taken critically, but one of the crew of the "Oliver Cromwell" informs me that during the voyage he was frequently down in the fore and aft peak, and did not detect any unusual heat or vapour.
20. The hold was not completely filled in either ship, but the cargo was stowed high up to the main hatch, the ends being more open, but there was an unobstructed space from top of coals to deck the entire length of the ship.
21. The captain of the "Oliver Cromwell" stated to me that the first thing each morning, when he went on deck, he had the hatches taken off when the weather permitted, which it generally did. I did not learn that any water ever got down into the hold.
22. Water was poured down the hold, wet sails were put across the hatches and everything done to stop ventilation as much as possible.
23. Good fire-engine and plenty of hose in each case.
24. Speaking without any technical knowledge on the subject, I attribute these losses entirely to the nature of the coal. I may add that during an experience of about 25 years as an insurance broker I have largely insured coal cargoes to all parts of the world; with the exception of these two, I only had one case of burning, viz., the "Sir George Seymour," in 1867, from Birkenhead to Bombay, but in 1871, I effected insurances on the ships "Baringa" and "Sea Pink," the former an iron ship, the latter a wooden; both loaded from the Tyne for Bombay, neither of which were ever heard of, and as both were well found and well owned vessels, I have always considered that their loss was attributable to combustion rather than any other cause.

My experience, both as a ship owner and as shipping coal on my own account, is confined entirely to steam coal.

"EETA."

From Messrs. W. & J. Smith, London.

1. "Eeta," A1, 13 years, built 1874, sailing.
2. London, sailed 8th June 1874.
3. New Amsterdam, Berbice.
4. About 20th July, only a day or two before arrival in port, which she reached 22nd July.
5. Wood.
6. Not any.
7. 332 register.
8. 253 tons 7 cwt.
9.

Swadlincote	-	-	106 3
Baddersley	-	-	50 14
Babbington	-	-	96 10
			253 7

11. By a metal cowl ventilator forward and aft and screw ventilator in the bollards.
12. We think about midships, in the centre of the coals.
13. About 38 days.
14. Six to ten days.
15. From basket out of craft; they could only fall the depth of the hold.
20. No.
21. We had a very careful master and feel confident no water could have got down, and no general cargo was damaged, which must have been the case as the whole of the upper part was general.
22. General cargo was removed to give access to coals and water thrown down; this not proving effectual, we understand a hole or holes were bored in her to flood the floor and preserve the keelson, and everything done to smother it; the water washing in the hold greatly reduced it, and on arrival labour was obtained to discharge the upper cargo to put water on and pump, but the fire increasing she was taken on a mud bank and scuttled sufficiently to extinguish it. In this case only the coals were damaged, the ship and general cargo being saved.

"ALEXANDRE."

From Messrs. Agacio & Co., Liverpool.

1. French sailing ship "Alexandre," built at Glasgow, in 1869.
2. 23rd June 1874, Liverpool.
3. Valparaiso.
4. Took fire at sea, near Montevideo, and was scuttled to extinguish the fire.
5. Iron.
6. No.
8. 1,135.
9. Lancashire best orrell steam coal, double screened, bought from Messrs. W. H. Brancker & Co., Oldhall Street, Liverpool.
10. Ourselves.
11. The ships' hold was ventilated by means of a wooden case parallel to the keelson from fore to aft, 15-inch square, bored with holes and connected with three perpendicular similar cases projecting 4 feet over the hatches when shut.
12. Do not know.
13. She began to load in June 1874.
14. The coal was fresh wrought, but cannot state time before being put on board.
15. Loaded from waggons at the High Level Bramley Moore Dock.
16. Do not know.
17. Do not know.
18. Do not know.
19. In another ship, the "Coquimbo," the cargo was so heated that on her arrival at Callao, in March of this year, the captain found 40% of heat in the ship's hold.
20. Not completely.
21. Do not know.
22. Do not know.
23. Do not know.
24. Do not know.

"BRENHILDA."

From Captain Scurr.

1. "Brenhilda," A1, first voyage. Sailing.
2. 23rd June 1874. Glasgow.
3. Calcutta.
4. I cannot state to date exactly, on two different occasions I found the coals heated, smoking and smelling strong of gas. I turned them over and removed about 20 tons until all heat and gas subsided.
5. Iron.
6. No.

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7. 1,321 tons.
8. 1,776 tons.
10. Watson.
11. Yes, one ventilator each hatch from upper deck to keelson, four large ventilators from upper deck to 'tween decks.
12. Fore hatch in lower hold.
13. About seven weeks.
14. I believe the coal came direct from the pit.
15. Waggon, by steam crane, about 5 feet from deck.
16. Very fine.
17. Dry.
18. Yes, refer to 4.
19. No, I examined the fore and after hatch daily, the main hatch never being unbattened.
20. No; from fore part of the fore hatch clear, and the after part of the after hatch 'tween deck hatches, all off; about 600 tons in 'tween decks.
21. Fore hatch open in fine weather, after hatch flap always open, and lee side of ventilators.
22. When heated turned them over, when fire broke out pumped water down.
23. Steam donkey pump, head pump, and fire engine, or force pump.
24. By coals coming direct from the pits.

The following letter was received by the owners from Captain Scurr:—

GENTLEMEN,

I BEG to state that fire broke out 6th November in Calcutta in the fore hatch where I had turned the coals over on my passage out. I applied for the steam floating engine, and the port conservator sent it alongside at once, and put six jets on board, they putting 3 feet 6 inches water in the ship; in half hour all smoke and gas ceasing, I stopped pumping. At the time I should say I had discharged 500 tons of coal out of the main and after hatch. On getting down to the heated coals I found about 15 cwt. to a ton like a cinder or rather resembling coke. I have carried one cargo of coals out to Bombay from Sunderland, year 1866; 1,800 tons in the ship "Thomdean" with no ventilators, and never opened the main or after hatch, the fore hatch seldom; making a long passage of 130 days.

In 1853 I was seaman on board the ship "Hannah," from London to San Francisco with coals, no ventilators, the coals being six months on board and never heated.

JOHN SCURR.

"ADMIRAL FITZROY."

From Mr. J. E. BURGESS, Swansea.

1. "Admiral Fitzroy," 13 years, A1 10 years, sailing.
2. July 1874, Cardiff.
3. Valparaiso.
4. September 22nd, 1874, in lat. 53° 20′ S., long. 63° 8′ W.
5. Wood.
6. Very little.
7. 377 nett.
8. 525.
9. Insole's No. 3, Rhondda, worked from Cymmer Colliery, and from No. 3 Rhondda Seam, shipped through and through as worked.
10. Hy. Bath and Sons.
11. Main body of the cargo, say from abaft side mainmast to foremast, was divided by running deals up on either side of hold, stanchions from keelson to main deck, and left open at top.
12. Blew up all the main decks from fore part of main hatches to the poop; this took place at noon, and at 1 p.m. same day flames were coming up through the hatch.
13. Ten weeks.
14. A few hours.
15. By waggon; the first 120 tons would fall the depth of the ship, the balance would have only a few feet to fall.
16. Wet.
17. Slightly wet.
18. At 2 p.m. of the 21st September, a quantity of smoke was observed coming up the fore hatch, and on examination coals were found to be very hot and impossible to stop below. At 4 p.m. fore hatch was battened down, the cargo being evidently on fire; at noon of the 22nd inst. an explosion took place, which blew the main decks out from fore part of main hatch to the poop, and at 1 p.m. flames were coming up through the hatch.
20. Yes.
23. Not any.
24. I am unable to suggest any cause for this catastrophe, for the coals were shipped as No. 3 Rhondda, which is reported to be the purest coal in South Wales, and is entirely free from sulphur, whereas spontaneous combustion in coal is, I believe, usually attributed to water and iron pyrites, the unison of which gives rise to intense heat, something on the principle of slaked lime; if this was the cause of combustion in this instance, the coal must have been mixed, which may probably have been done (but now difficult to ascertain), as coals were very scarce at the time, and the vessel was on demurrage.

"DUMBARTONSHIRE."

From Mr. THOMAS LAW.

1. "Dumbartonshire," 100 A1., new, sailing ship.
2. June 1874, Glasgow.
3. Buenos Ayres.
4. 6th September 1874, at Buenos Ayres.
5. Iron.
6. Made no water.
7. 915 and 972.
8. 540 tons.
9. Splint. Russell's Colliery.
10. Owner.
11. Was only ventilated near main mast, but the mooring pipes acted as ventilators also.
12. Fore part.
13. About two months.
15. Was loaded by wheelbarrows.
16. Good weather both loading and during the voyage.
18. About 24 hours, by great heat.
19. No.
20. No. Ship had a general cargo.
21. Hatches were not opened often.
22. First poured water on coal, and then scuttled the ship.
23. Fire engine.
24. Cannot say.

"INDUSTRY."

From Mr. R. ROBBINS, Kenilworth.

1. "Industry," 5/6 L. 1. 1. in veritas, built in 1858; sailing.
2. July 1874, North Shields.
3. Bombay.
4. 19th October 1874, lat. 33° 47′ S., long. 52° 47′ E.
5. Wood.
6. None.
7. 1,138 tons.
8. 1,475 tons.
9. Davison's West Hartley Steam Coal, wrought out of Bidlington's collieries, most probably all from Low Main seam; ordinary single screened, as customary in the district.
10. Hickie, Borman, & Co. London.
11. Ventilator fore and aft, the ship's keelson and shaft through each hatch leading into it; the fore and aft hatches were never on, and ventilation well looked after.
12. After hatch.
13. Between three and four months.
14. They were drawn out of the earth and put at once into the ship.
15. From waggon by spout with a fall of about 24 feet when commencing to load.
16. Fine and dry, nothing of note occurred, no heavy seas got down the hatches.
17. The coals when shipped looked exceedingly well; were large, good, and dry.

Gas in cabin, and smoke from aft hatch two days before vessel was abandoned.

20. The ship was not full excepting in the main hatch, room at each end for about 90 tons.
21. See answer to questions Nos. 11 and 16.
22. All hatches opened.
23. None.
24. To the too rapid transition of the coal from the bowels of the earth to the ship's hold.

"MINDORA."

From Messrs. STODDART BROS., Liverpool.

1. "Mindora," A1 at Lloyd's, built 1865, sailing ship.
2. Birkenhead, July 1874.
3. Bombay.

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4. Took fire firs on 16th October 1874, then on 29th November, and again 2nd December.
5. Wood.
6. None.
7. 971 tons register.
8. 1,416 tons.
9. Coal purchased from Robert James & Co., coal merchants, 3, George's Dock Gates, Liverpool, to whom refer.
10. Messrs. Edward Lawrence & Co., Liverpool.
11. Yes; a trunk on each side of the keelson the length of the hold and connected with it, a trunk up to each hatch and reaching above the deck; open at top; all of wood.
12. Main and after hatch.
13. About two months and a half.
14. Refer to Robert James & Co., George Dock Gate, Liverpool.
15. By the hydraulic tip at Birkenhead. The waggons are lifted by the tip and brought over ship's hatch. The greatest fall for coal would be about 10 to 12 feet. Ballast coal (350 tons) previously lowered into vessel's lower hold.
16. Weather fine when loading, and fine generally on the voyage.
17. Cannot say.
18. Early in October. Coals were hot.
19. Cannot say; captain is still abroad in the ship.
20. In the centre she was, and gradually tapered off to both ends.
21. Cannot tell; captain is still in India with the ship.
22. Captain does not state what he did at sea. On arrival at Bombay, on 2nd December, the water boat was sent to the ship and pumped water on the coal.
23. Fire engine.
24. Cannot determine any particular cause.

"STAFFORDSHIRE," "MONMOUTHSHIRE."

From Mr. D. STUART.

1. "Staffordshire" and "Monmouthshire," A1, 11 years, sailing.
2. 1874, Liverpool.
3. San Francisco.
4. In both cases about 70 days out.
5. Iron.
6. None.
7. 1,172 and 1,167 tons respectively.
8. "Staffordshire," 814 tons; "Monmouthshire," 1,500 tons.
9. Lancashire steam coal, White Moss coal; single screened.
10. J. G. & W. Barnes.
11. Yes; the ordinary mode; wood.
12. Lower hold.
13. About 100 days.
14. A very short time, to the best of my knowledge.
15. From the high level. The fall was small.
16. Very fine.
17. Quite dry.
18. Only a few days.
19. I am unable to answer.
20. In the second case, yes; in the first, no.
21. I do not know.
22. In the first case the ship was taken to the nearest port and scuttled. In the second case the fire was promptly extinguished and a small jettison effected.
23. Ordinary fire-engines.
24. The newness of the coal solely.

"GLEN TILT."

From Messrs. HUGHES & Co., Menai Bridge.

1. Sailing ship, "Glen Tilt," A1, built 1865.
2. July 30th 1874, Cardiff.
3. Coquimbo (Chili).
4. October 28th, 1874, off Cape Horn.
5. Wood.
6. Little or none.
7. 991 tons net.
8. 610 tons coal, 591 tons coke.
9. Non-screened smelting coal, Pen-y-graig colliery.
10. Pen-y-graig Coal Company.
11. Ventilated with platform under cargo.
12. Between the after part of fore hatch and after part of main hatch.
13. From date of leaving Cardiff, 30th July, to arrival at Port Stanley, Falkland Islands (to which place ship put back to), 11th November.
14. Cannot say.
15. Depth of hold 21 feet; it slid down the shoot to combings of hatches.
16. Very fine dry weather.
17. Very moist.
18. None that we are aware of.
19. Cannot tell.
20. Not quite; large space forward, coal being in *the bottom* and coke on the top.
21. We believe hatches were not opened, nor did any water get down.
22. Cargo was got up to get at the fire, but it became too hot to work, and then the hatches were battened and well caulked. Ultimately the decks got very much heated, and holes were then bored in the decks and waterways to pour down water.
23. Pumps.
24. To gas, inferior quality, and damp state of the coals at time of shipment.

"ONTARIO."

From Messrs. JOHN VAUGHAN & Co., Liverpool.

1. "Ontario," 3/3 to 1.1., Veritas; built 1861. Sailing vessel.
2. 1 to 7 of August 1874, at Tyne.
3. Bombay.
4. 22 January 1875, at sea.
5. Wood.
6. Perfectly tight.
7. Her net register tonnage is 1,062 tons.
8. About 1,500 tons coals, and 100 tons coke.
9. West Hartley Main coals.
10. Livingstone, Briggs & Co., London.
11. Was well ventilated, a ventilator in each hatch, and along each side of the keelson under the coals.
12. Main hatch.
13. About 5½ months.
14. Unknown to us.
15. The vessel loaded from tips, not from waggons.
16. Fine, with occasional showers; weather during voyage unknown to us.
17. Unknown.
18. No indication given, until volumes of smoke issued out of the ventilators.
19. No.
20. No.
21. Unknown to us.
22. Water was poured down, and the vessel run ashore and scuttled.
23. Fire-engine.

"NORTHBROOK."

From Messrs. ADAMSON AND RONALDSON, London.

1. "Northbrook." When new, 100 A 1. Sailing ship.
2. August 1874. The Tyne.
3. Madras.
4. December 1874, Madras Roads.
5. Iron.
6. None.
7. 1,820 tons net, 1,876 gross.
8. 1,656 tons coal and 866 coke.
9. Not known.
10. James Burgess and Sons.
11. By iron ventilators, and a free current of air through the hold.
12. After hold, immediately under hatch.
13. 120 days.
14. Not known.
15. From waggons; about 30 feet.
16. Changeable.
17. Slightly damp.
18. None.
19. Occasionally.
20. No.
21. Closed only during very bad weather or much rain; a small portion of water may have got below.
22. The hatches were immediately closed, and a hose supplied by a steam pump, pointed to the seat of fire, and a constant supply of water kept up.
23. Steam pump.
24. Damp.

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"NEW LAMPEDO."

From Messrs. SEED, ARMSTRONG, & Co. Liverpool.

1. "New Lampedo" 3·3, 11 Veritas 5 years, age about 10 years, sailing ship.
2. 10th August, 1874. Liverpool.
3. Panama.
4. Abandoned 16th November off Cape Horn.
5. Spruce and hackmatack with birch floors.
6. Made no water.
7. Nett 1,099, gross about 1,127.
8. 1,499 tons.
9. Don't know.
10. J. G. & W. Barnes.
11. Her San Francisco grain lining was left in up to her 'tween decks which was Oregon pine; deck ventilators fore and aft.
12. It was supposed the fire originated in the main hatch low down.
13. Three months.
14. Don't know.
15. From the height of her decks.
16. Very wet weather at the time of loading.
17. Coal very moist when taken on board.
19. No.
20. No.
21. Hatches open at all times when possible; no water got into hold.
22. Battened down when there was indication of fire.
23. None.
24. Cannot tell.

"ENTHUSIAST."

From Messrs. W. & J. SMITH, London.

1. "Enthusiast" A 1, built 1854, sailing ship.
2. Sailed from London, about 11th August 1874.
3. Demerara.
4. Abandoned at sea, 14th September. on fire.
5. Wood.
7. 283 register.
8. 114 tons.
9. Swadlincote, singie screened.
13. She was abandoned on fire, 14th September, shipped about 21st or 22nd July, say 53 days.
14. 6 to 10 days.
15. Out of basket from craft.
20. No, only a part of her general cargo.

"LA ESCOCESA."

From Messrs. BALFOUR, WILLIAMS, & Co. Liverpool.

1. Sailing ship "La Escocesa"
2. Cardiff, September 1874.
3. Valparaiso and Payta.
4. Five days previous to her arrival at Payta.
5. Iron.
6. No.
7. 946 net, 988 gross.
8. 1400 tons.
9. South Wales shipped at Cardiff; colliery, not known.
11. Yes, with fore and aft along keelson and three vertical ventilators as per sketch attached.
12. Amidships.
13. 130 days.
14. Very short time.
15. From coal tips at Cardiff.
16. Raining heavily.
18. Smouldering five days previous to the arrival; after the arrival the hatches were opened, 400 hundred tons discharged previous to actual fire.
19. Not known, captain not yet arrived home.
20. No.
21. Same reply as to No. 19.
22. Closed all ventilation when fire actually broke out, ship was scuttled by crew of ship with assistance of one of Her Majesty's frigates.
23. Fire-engine, hose and buckets.
24. Coals green and weather wet while loading.

"TRY."

From Messrs. W. and J. SMITH, London.

1. "Try," A1, built 1866. Sailing.
2. London, sailed 4th September 1874.
3. Georgetown, Demerara.
4. 13th October, at sea; smoke found coming up fore hatch.
5. Wood.
6. There is no report of it in the protest.
7. 428.
8. 107 tons 15 cwt.
9. 57 13 Swadlincote.
   50 2 Hockley Hall.

   107 15

11. Being a sugar trader we think so, but do not know of our own knowledge.
12. Fore hold.
13. About 60 days.
14. Six to 10 days.
15. By basket from craft.
18. Not any.
20. No, only a small part of the cargo.
22. The cargo was got on deck and water thrown down until the fire was subdued.

"CRYSTAL."

From Messrs. W. and J. SMITH, London.

1. "Crystal," A1 10 years, built 1872. Sailing ship.
2. 5th September 1874, from London.
3. Berbice River (New Amsterdam).
4. In the Berbice River; she arrived there 23rd October, and after discharging nearly all general cargo the coals were found on fire, we think it was about 31st October.
5. Wood.
6. Not any.
7. 263.
8. 239 tons 5 cwt.
9. 102 tons 11 cwt. Hockley Hall, 136 tons 14 cwt. Swadlincote; as to seam, &c.
11. By two cowl metal ventilators, one forward and one aft, and the after hatch was frequently off we believe in fine weather.
12. Near the foremast and within a few feet of the ventilator.
13. Under 80 days.
14. Six to 10 days.
15. By baskets from lighters. They fall only from deck to bottom for first few tons, and afterwards on the pile and run down.
18. Not any indication.
19. It was not taken as far as we know, but nothing excited attention during the voyage or discharge of the cargo stowed over the coals.
20. No.
21. We understand the weather was fine and we are quite confident no water would be allowed to enter; all the top was general cargo and she has an old, most experienced, and careful captain.
22. Immediately it was discovered it was subdued by water being thrown on the spot on fire, this operation being of course a simple matter in consequence of all the other cargo being out, and ship in port.

"KHERSONESE."

From Mr. GEORGE DUNCAN.

1. "Khersonese," 100 A1, built 1855, sailing ship.
2. Shields, 19th September 1874.
3. Bombay, calling at Galle.
4. Bombay, 20th February 1875.
5. Iron.
6. None.
7. 1,811 gross, 1,711 nett.
8. 2,022 tons.
9. Bebside West Hartley steam, best quality, double screened.
10. James Walton.
11. Same as stated in the "Indian Empire" case.
12. In the way of the main hatch, about half way down.
13. 154 days.

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14. Cannot say; think some of it a very short time, say not more than 12 hours.
15. Loaded from waggon, coal falling 15 to 20 feet.
16. Weather showery during shipment, not seriously wet; rough passage out of the Channel, afterwards fine weather.
17. Cannot say; believed in ordinary state.
18. Fire broke out three days after commencing to discharge cargo; no previous indication.
19. No.
20. No; a considerable space n the three holds and at ends of ship.
21. It is a standing order for hatches to be off during good weather; believe no water went down.
22. Floating fire-engine brought alongside, and fire extinguished without damage to ship.
23. Fire-engine and head pump.
24. Coals shipped too soon after being wrought, and not sufficiently screened.

"THE FOUNDLING."

From Mr. E. Bates.

1. "The Foundling," A1, 20 years, and AA1, built 1866 iron sailing vessel.
2. Birkenhead, 24th September 1874.
3. Bombay.
4. 21st November 1874.
5. Iron.
6. None.
7. 1,186 tons.
8. Mixed cargo, 100 tons iron and 100 tons bricks, 200 tons coke; 795 tons Westminster Brymbo coals, 306 tons Oaks Pits coals.
9. North Wales Main steam coals; 795 tons from Westminster Brymbo Coal and Iron Company's Colliery, and 306 tons from Oaks Pits Colliery, Mold.
10. Edward Bates & Sons.
11. Yes; in addition to permanent iron ventilators a wooden shaft through the coals and down each hatchway.
12. Supposed in main hold under main hatch.
13. About two months.
14. Unknown; probably a week.
15. By tips; coals run down a shoot into the hold, falling the height from deck to coals.
16. Wet.
18. Smoke observed issuing from main ventilator on 19th November; hold full of smoke, 20th November; flames bursting out, 21st November.
19. Believe not.
20. No; ship was not full; large space over coals in lower hold.
21. No water got down; unknown time hatches were off.
22. 19th November, took hatches off, pumped water into hold for 2½ hours, then battened hatches down.
23. None.
24. Unknown.

"LEVANT."

From Mr. John Jones, Milford.

1. "Levant" class A1, 12 years, 9 years old last April, sailing.
2. September 1874, Swansea.
3. Valparaiso for orders.
4. 8th of January 1875. Lat. 60° South, long. 73° West.
5. Oak teak and green heart.
6. Did not make water.
7. 314 tons register.
8. 470 tons of coal, 10 tons of powder, 1 ton of fusees.
9. Smelting coal for copper works, do not know the name of the colliery, not screened.
10. Messrs. Elford, Williams, & Co., Swansea.
11. With three boxes one in each hatch, made of wood.
12. Seven feet before the foreside of the main hatch, and at the bottom of the vessel.
13. About 100 days.
14. Do not know.
15. From waggons, about 20 feet fall.
16. Partly wet, latter part dry; generally strong weather.
17. Did not observe.
18. Captain has left the ship, do not know.
19. Do not know.
20. Within four feet of the deck.
21. Do not know.
22. Threw the 10 tons of powder and 1 ton of fusees overboard and battened all down.
23. None, except buckets to pour water on the coal.
24. Do not know.

"CITY OF RICHMOND."

From Mr. Donald Kennedy, Liverpool.

1. "City of Richmond," 3/3 Veritas; 10 years old. Sailing ship.
2. Birkenhead, October 1874.
3. Bombay.
4. 9th March 1875, Bombay; combustion.
5. Wood.
6. None.
7. 1,284 total, 1,241 nett register.
8. 1,638.
9. Laird's West Hartley seam, to be double screened.
10. Messrs. Bussaby and Wichelhaus, from Liverpool.
11. 3 in. deal (spruce) platform, with wooden ventilators up each hatch.
12. Believe about main hatch.
13. 4½ months.
14. A few days.
15. Tip.
16. Ordinary weather for season of year.
17. Ordinary state.
18. Found to be very much heated during discharge.
19. Don't know.
20. No.
21. Hatches open all fair weather; no water got down.
22. Water poured down.
23. Usual (ship) fire-engine.
24. Don't know.

"FEDALMA."

From Mr. J. Hamlyn (Master), by Messrs. Scrutton & Co., Shipowners.

1. "Fedalma," A1, 4½ years, sailing ship, barque.
2. 12th October 1874, Porthcawl, Wales.
3. "Valparaiso" for orders, ordered to Chanaral.
4. 6th February 1875, at Chanaral.
5. Iron.
6. Made no water.
7. Nett $478\frac{48}{100}$, gross $507\frac{41}{100}$.
8. 654 tons.
9. Smelting, from the "Aber Coal Company," not screened.
10. Messrs. W. Nicholson & Sons, Sunderland.
11. The ship was ventilated, fore and aft, by stantions from deck to keelson and 1½ boards nailed to them, thus leaving a space of 6 in. broad from top to bottom, and dividing the whole cargo in the middle.
12. On the starboard wing, from the after part of main hatch, and extended 20 feet aft, also from ceiling 4 feet up, the coals on fire being about 4 feet deep.
13. 117 days.
14. I do not know for certain, but was told they came direct from the pit.
15. The coals were shot from the wagon into a shute of about 20 ft. in length, and thus conducted to the combings of the hatchway; the depth of the ship's hold 16 feet 4 inches.
16. Fine and dry during the time of loading, not much rain during the passage.
17. Very dry when shipped and quite dry during the voyage, that is, having only the usual moisture in the dryed coals, viz., about 3 per cent.
18. The coals were warm just about 2 feet under the surface when we commenced to discharge, and when we got down about 4 ft. it became quite cool in all parts except the starboard wing, which got hotter the farther we got down, and the first indication was a jet of white steam, with the smell of paraffin oil which came from under the stringer.
19. Only by going into the hold and feeling with the hand, and this was done every day the hatches were taken off.
20. No, only about two-thirds full, falling from 2 feet 6 inches below the main hatch to nothing fore and aft.
21. Some part of almost every day; and I do not believe a bucket full of water went into the hold.
22. To discharge the coals as quick as possible, working all hatches to cut the fire off from going further aft.
23. Plenty of fire buckets.

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CASES OF EXPLOSION.

THE FOLLOWING PARTICULARS OF CASES OF EXPLOSION OF GAS ON BOARD COAL-LADEN SHIPS HAVE BEEN SENT IN ANSWER TO THE FOREGOING QUESTIONS :—

"MEUSE."

From Messrs. N. PAQUET & Co., Marseilles.

1. "Meuse," built in 1872, steamer.
2. The 10th or 14th August 1874.
3. Port Said.
4. 23rd August, about 10 miles north-west of Cape Bengut Algiers.
5. Iron.
6. Did not make water.
7. $\frac{1334}{498}$.
8. 1,100 tons.
9. Invoice, stated, Wood's, Merthyr, large.
10. H. Worms & Co.
11. Not ventilated.
12. In the fore hold.
13. About eight days.
14. We do not know, probably not long, as the gas still existed.
15. By the ordinary method in use at Cardiff, from wagons which are lowered to the hatches.
16. Bad weather till we entered the Mediterranean, with fine weather from then till the time of the explosion.
17. Not known.
18. None.
19. Temperature was not taken.
20. There was a considerable space below the spar deck.
21. The hatches had not been off until such time that the explosion took place. It was said that the hatches were taken off the evening before but this was not well confirmed.
22. The heating of the coals was not detected until the explosion occurred, which caused us to return to Algiers, where the coals were discharged without further damage.
23. Nothing special beyond the pumps with which all steamers are supplied.
24. We believe that this explosion was caused by a man decending the hatchway with a naked light, and this man was the first victim of the explosion so caused. This was not a case of spontaneous combustion.

"HOLYROOD."

From Mr. E. C. DOWNING, Cardiff.

1. "Holyrood" steamship, of Limerick, A1, built in 1857.
2. Cardiff September 23rd, 1868.
3. Limerick.
4. September 23rd 1868 in main hold. Cardiff.
5. Iron.
6. None.
7. 296 net, 358 gross.
8. 585 tons.
9. Cardiff Merthyr steam coal, 414 tons from Ocean Collieries, 171 tons from D. Davis and Sons, Merthyr Collieries (through and through coal).
10. E. C. Downing.
11. Not ventilated at all.
12. Mainhold.
13. About 24 hours.
14. Probably not more than 24 hours, perhaps not so long.
15. Ex-waggons; the fall was very little, perhaps 2 or 3 feet.
16. Fine.
17. Dry when shipped.
19. No.
20. The hold was completely filled aft under the cabin, but there was room forward for 10 or 12 tons coal; the hatchway was quite filled up with coal. The cargo was shipped and then 71 tons coal for bunkers were tipped on the hatchway and wheeled to the bunkers; this occupied several hours; when done the men were about to clear the hatchway and one man went below to trim down the coal, another man handed down a *lighted* candle, when an explosion occurred damaging the steamer slightly, but seriously burning the two men.
24. To the want of ventilation and the exposure of a naked light.

"BATTALION."

From Mr. WM. LAING, Leith.

1. "Battalion." A1 two years. Steam.
2. 6th March 1863, Cardiff.
3. London.
4. 8th March 1863; channel; explosion.
5. Iron.
6. None.
7. 574–694.
8. 715 tons.
9. "Navigation" steam coal (late "Nixon's Duffryn").
10. Nicon, Taylor, and Cory.
11. Not ventilated.
12. Fore hold.
13. About four days.
14. Unknown.
15. Unknown.
16. Unknown.
17. Unknown.
18. No.
19. No.
20. No.
21. Unknown.
22. Unknown.
23. Nothing beyond engine pumps.
24. To the accumulation and concentration of gas in the fore hold, which was not half full, and contact with a naked light which a sailor carried down, in order to get the square-sail out of the hold.

"BROOMHAUGH."

From Messrs. ELLIOTT, LOWREY, and DUNFORD, Newcastle-on-Tyne.

1. "Broomhaugh;" 90 A1, 1872; steam.
2. September 1873 (sailed 14th), Cardiff.
3. Port Said.
4. 20th September 1873. Near Gibraltar.
5. Iron.
6. Ship made no water.
7. 1,352 tons; 865 tons.
8. 1,576.
9. Powell Duffryn steam coal; double screened.
11. Not ventilated.
12. Fore peak and fore hold.
(The explosion first occurred in the peak; the fire then penetrated to the fore hold, where there was also a vacant space, resulting in a second explosion there.)
13. Seven days.
14. A few hours.
15. From tips. Coals would run through a shoot for about 50 feet.
16. Very wet during loading; do. passage to Gibraltar.
17. Coals, considering the weather, would be much wet in transit from pit to ship.
18. None.
19. No.
20. None of the holds were full.
21. All the hatches off from loading till midnight of 14th. State of the weather would not permit of their being removed again until the explosion.
22. No indication until explosion.
23. Fire-hose and buckets.
24. September 1873.—All went well until the 20th of same month, when one of the crew having occasion to sound the water tank in the fore-peak, proceeded (having first provided himself with a lamp) to remove the hatch and descend into the peak.

Whilst standing over the hatchway with the lamp in his hand it was noticed by those in the vicinity that a blue light seemed to encircle the lamp, caused, no doubt, by the accumulated gas from the cargo in this unoccupied space; the gas becoming ignited burnt the man's hand, causing him to drop the lamp down the hatch. The effect was instantaneous. There was a loud explosion; the decks were blown up from the foremast to the forecastle; bulkheads blown down, and generally the fore part of the ship was made a complete wreck.

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"THAMES."

From Mr. H. CLOAKE, Cardiff.

1. "Thames," steamship.
2. First explosion occurred May 1861 after loading at Swansea, second explosion was July same year from same port.
3. First voyage, Alicante; second voyage, Valencia.
4. First explosion occurred off or near Lisbon after being out about five days, severely burning chief engineer rendering him incapable of duty all voyage; second explosion occurred on leaving piers of Swansea and burning second engineer who had been ordered to take no light down in the tunnel or compartments.
5. Iron.
6. No.
7. 191 net, 302 gross.
8. 360 cargo and 60 bunkers.
9. First cargo. I believe, was Wayne's Merthyr single screened; second was a mixed cargo.
10. Cannot remember.
11. We had ventilators fitted in each hold, of the same description as those used for the stoke hole.
12. Both explosions occurred in the compartment aft, entrance to which was from the cabin down a trelliced hatch, but the gas had accumulated further aft. Engineer, who had been in boat some time, took a match down and struck light, but had been cautioned to use safety lamps.
13. First case about 7 days, second case not 24 hours.
14. I am under impression that coal was shipped soon after worked.
15. From trucks containing 8 to 10 tons each; the shute down which coal came from the trucks being on level with combings.
20. We had much space vacant in both holds.
21. On first occasion the hatches were occasionally off; on second occasion the hatches had not been on since loading. It is my opinion that often when hatches are off that much harm is done by salt water going down; being cargo coals it is supposed often that they cannot damage, but the wet during long voyages is the cause of most of the fires.
24. To accumulation of gas in the after end and a naked light being, used although against express orders and proper lamps being available.

"WILLIAM BATTERS."

From WILLIAM BATTERS.

1. "William Batters." A. 90. New ship. Steam.
2. 16th and 17th September 1873; Cardiff.
3. St. Nazaire.
4. 18th September 1873. Penarth Roads just outside Cardiff.
5. Iron.
6. None.
7. 530 nett, 829 gross registered tonnage.
8. About 1,040.
9. Small coal collected from several collieries.
10. C. Goddard of Nantes and Cardiff.
11. No special ventilation, but the hatches were off at the time of the explosion.
12. In the fore part of the fore hold.
13. About 48 hours.
14. I could never ascertain, although I tried to do so at the request of underwriters.
15. From tips in the usual manner at Cardiff.
16. Fine.
17. Usual condition of small coal; did not present any difference as regards appearance.
18 and 19. The voyage had barely commenced.
20. Not at the part where the explosion originated.
21. See reply to 18th and 19th queries.
22. No such indications were perceptible.
23. A powerful donkey engine and fire hose.
24. There were two scuttles, alike in appearance and close together, one on the fore side of the forward bulkhead leading to the chain locker, and one on the after side leading to a store-room, taken out of the fore hold and constructed of wood; there is little doubt that the gas had passed through the joints and connexions of the wooden structure and accumulated in the store-room. The ship was weighing anchor at daybreak, a man went with a naked light to stow the cable in the chain locker, and instead of going down through the forward scuttle made a mistake, lifted the after scuttle, and the explosion was the result.

"J. H. LORENTZEN."

From H. LORENTZEN.

1. "J. H. Lorentzen," steamship. 16 years at Liverpool. Age, built in 1872.
2. October 30, 1874, at Sunderland.
3. Hamburg.
4. South Dock, Sunderland, October 30th, 1874.
5. Iron.
6. No.
7. 567 net, 884 gross.
8. 1,056$\frac{4}{20}$ tons.
9. 611 tons Ryhope Hartley steam (best screened) and 445$\frac{4}{20}$ tons of Ryhope treble-screened nuts; out of Maudlin seam, Ryhope Colliery.
10. J. S. Barwick.
11. No.
12. In the fore hold where the steam coals were.
13. Just shipped.
14. A few hours.
15. From waggon into a spout that was level with the ship's hold.
16. Fine weather. Accident took place an hour after ship was loaded.
17. Dry.
18. No.
19. Ship had just commenced the voyage.
20. Very nearly.
21. See answer to No. 19.
22. None, because none were necessary as it was just an explosion that blew off the hatches and singed the paint a little.
23. Donkey pump.
24. Through the hatches being battened down too soon for coals that had just come out of the pit.

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APPENDIX V.

STATISTICS prepared by LLOYDS especially for the Commission.

SHIPMENTS OF COAL, 1874.

TABLE showing the Number of COAL SHIPMENTS and the QUANTITIES SHIPPED from the UNITED KINGDOM to FOREIGN PORTS in 1874, and the NUMBER of CASUALTIES which occurred from SPONTANEOUS COMBUSTION.

(This Table was compiled by Lloyd's from Returns furnished by the Custom House Authorities at the various Ports of the United Kingdom.)

—	NUMBER OF SHIPMENTS.												QUANTITIES SHIPPED.					
	Cargoes under 500 Tons.	Casualties from Fire or Heat.	Cargoes 500 and under 1,000 Tons.	Casualties from Fire or Heat.	Cargoes 1,000 and under 1,500 Tons.	Casualties from Fire or Heat.	Cargoes 1,500 and under 2,000 Tons.	Casualties from Fire or Heat.	Cargoes 2,000 and upwards.	Casualties from Fire or Heat.	Total Number of Vessels.	Total Casualties from Fire or Heat.	Cargoes under 500 Tons.	Cargoes 500 and under 1,000 Tons.	Cargoes 1,000 and under 1,500 Tons.	Cargoes 1,500 and under 2,000 Tons.	Cargoes 2,000 Tons and upwards.	Total Quantity of shipped Tons.
Baltic - - -	4,993	1	903	1	304	—	40	—	—	—	6,240	2	1,310,392	602,871	352,152	64,663	—	2,330,078
Mediterranean - -	1,390	1	1,614	2	583	—	105	—	19	—	3,711	3	419,104	1,085,373	684,937	175,243	39,359	2,404,016
Black Sea - -	201	1	298	4	123	—	30	—	4	—	656	5	69,394	212,508	147,994	49,654	8,109	487,659
Other European ports -	13,113	—	2,241	—	666	—	4	—	—	—	16,024	—	2,776,766	1,790,323	717,921	6,418	—	5,291,428
Total, Europe -	19,697	3	5,056	7	1,676	—	179	—	23	—	26,631	10	4,575,656	3,691,075	1,903,004	295,978	47,468	10,513,181
North America - -	220	—	198	—	18	—	2	—	—	—	438	—	54,969	139,383	19,792	3,193	—	217,337
West Indies and Central America.	677	4	341	1	31	—	3	—	—	—	1,052	5	175,788	221,721	35,601	5,066	—	438,176
East Coast, South America	525	—	316	3	91	—	61	—	23	—	1,016	3	138,357	217,847	109,183	105,509	53,461	624,357
West Coast, South America	129	1	256	9	75	6	20	—	5	2	485	18	28,912	182,885	87,099	34,211	11,049	344,156
San Francisco - -	13	—	16	1	19	3	14	3	5	2	67	9	3,215	11,167	23,863	23,682	11,215	73,142
Total, America -	1,564	5	1,127	14	234	9	100	3	33	4	3,058	35	401,241	773,003	275,538	171,661	75,725	1,697,168
Africa, outside Gibraltar -	321	—	95	—	11	—	5	—	—	—	432	—	51,132	69,446	13,111	7,554	—	141,243
Asia - - -	224	—	279	3	245	8	203	11	44	3	995	25	44,433	208,451	308,875	346,256	109,405	1,017,420
Total, to all ports -	21,806	8	6,557	24	2,166	17	487	14	100	7	31,116	70	5,072,462	4,741,975	2,500,528	821,449	232,598	13,369,012

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COMBUSTION

TABLE

CASES of COMBUSTION previous to 1874, of which Particulars

Date of clearance.	Name of Vessel.	Owner or Master.	Tons.	How long built.	Wood or Iron.	Class.	Port of Loading.
January 1850	Columbia	John Ramsay (master)	517	2 years	Wood	A1	Liverpool
September 1850	Alfred of Belfast	Jas. Finlay (master)	1,073	5 „	Wood	—	London
(Autumn) 1852	Mary Shepherd	Gillespy and Scott	629	10 „	Wood	A1	London
June 1861	Admiral Lyons	Ross & Co.	1,133	5 „	Wood	A1	Sunderland
— 1861	Usk	Thos. Beynon	338	9 „	Wood	—	Swansea
August 1864	Joanna	Wm. Thomson	555	—	Wood	—	Leith
August 1864	Wanderer	„ „	639	—	Wood	—	„
August 1864	Annie Laurie	„ „	645	—	Wood	—	„
September 1864	Adelina	- - -	730	6 months	Iron	A1	Newcastle
September 1864	Lochee	Newton	1,501	9 years	Wood	—	Tay Port
September 1865	Glenlyon	Ross & Co.	1,440	—	Wood	—	Birkenhead
January 1866	Her Royal Highness	R. J. Hancock	1,244	8 „	Wood	A1	Cardiff
February 1868	Royal Family	Wm. Buchanan (master)	1,750	6 „	Wood	—	Birkenhead
September 1868	Persia	John H. Watt	1,290	7 „	Wood	A1	Greenock
— 1868	Hannah Law	Ross & Co.	—	—	Wood	—	Birkenhead
August 1869	Janet Cowan	- - -	1,278	—	Iron	A1	Greenock
October 1869	Serena	Geo. Symons (master)	493	3 „	Wood and iron	A1	Swánsea
May 1870	Glaramara	Brymner & Co.	475	13 „	Wood	A1	Greenock
May 1870	Vanda	Stoddart Bros.	1,081	5 „	Wood	A1	Shields
June 1870	Malabar	J. Galloway (master)	1,200	2 „	Iron	A1	London
August 1870	Serena	Geo. Symons (master)	493	4 „	Wood and iron	A1	Swansea
October 1870	L'Agouhanna	W. Kennedy (master)	1,103	5 „	Wood	A1	Birkenhead
August 1872	Cereal	Wilfred Hine	299	13 „	Wood	A1	Swansea
October 1872	Bivouac	Wm. Laing	721	1 „	Iron	—	Newcastle
December 1872	Henry Bath	W. Pease (master)	486	8 „	Wood	A1	Swansea
May 1873	County of Nairn	Messrs. Craig	999	3 „	Composite	A1	Glasgow
May 1873	Persia	Mr. George Duncan	1,704	20 „*	Wood	A1	Cardiff
June 1873	Prince Alfred	Gates	—	—	Wood	—	Hull
June 1873	St. Mungo	Gilmour & Co.	1,375	8 „	Iron	A1	Dundee
July 1873	George Douthwaite	Ralph Curry	362	13 „	Wood	A1	Hull
July 1873	Walter Baine	J. J. Grieve	898	5 „	Iron	AA1	Dundee
August 1873	Channel Light	Chas. Blades	553	6 „	- - -	—	Hull
August 1873	Isabella Kerr†	John Kerr & Co.	1,415	9 „	Iron and wood	A1	Dundee
September 1873	Arracan	Colin Caird (master)	1,010	12 „	Wood	A1	North Shields
September 1873	Indian Empire	Geo. Duncan	1,515	8 „	Iron	A1	Shields
December 1873	Mooreafoot	W. and R. Wright	1,183	10 „	Iron	A1	Shields
December 1873	John	John Frostick	367	13 „	Wood	A1	Porthcawl

* Almost rebuilt in 1865.
† The Isabella Kerr sailed again on 23rd Sept. 1874 with coal from Greenock for Bombay, and was posted at Lloyd's as missing 20th May 1875.

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OF COALS.

I.

have been sent in answer to the Circulars of the Commission.

Port of Destination.	Quantity shipped, tons.	Description of Coal.	How loaded, Barrows or Tips.	Whether ventilated, and how.	How long Coal had been on board.	Supposed Cause and extent of Casualty.	Weather when loading.
Aden - -	750	North Welsh - -	From craft	Ventilated	Over 3 months	Ventilation; fire -	Wet.
Valparaiso -	1,050	Tyne - - -	Dropped from deck 20 ft. first fall.	Not ventilated	Nearly 4 months	Want of ventilation and small coal.	Fine.
Shanghai -	—	Resolven (hand picked)	Baskets and lighters.	Ventilated	4 or 5 months	Wetness of coal, ship burnt.	Wet.
Bombay -	1,000 & 400 coke	Howard's West Hartley (double screened).	Spout	Ventilated	1¼ months	Wetness of coal, imperfect ventilation, height of fall; severe heating.	Wet.
Valparaiso -	450	Smelting coal (not screened).	Waggon and shoot.	Ventilated	Over 3 months	Wet state of cargo; ship burnt.	Raining.
Quebec -	442	Duke of Buccleugh (unscreened).	Waggon by crane.	Not ventilated	2 months	Quality of coal.	—
„ -	abt. 500	„ „ „	„ „	„ „	„ „	„ „	—
„ -	434	„ „ „	„ „	„ „	„ „	„ „	—
Shanghai -	1,102	Bebside West Hartley and Cowpen Hartley.	Waggon	Ventilated	6 months	Ship scuttled - -	Pretty dry.
Calcutta -	1,500	Townhill Colliery -	Tubs	Partially ventilated	3½ months	Wetness of coal; ship abandoned.	Very wet.
Bombay -	2,050	Westminster Brymbo (double screened).	Tips	Ventilated	5½ months	Loading by tips; fire extinguished.	Fine.
Valparaiso -	1,804	Rhonda No. 3, thro' and thro'.	Barrows	Well ventilated	3 months	Nature and wetness of coal; heating, cargo discharged and sold at Monte Video.	Rain.
Aden - -	2,500	Welsh steam - -	Wheeled on board.	Ventilated but ventilationstove in and broken.	Nearly 3 months	Injury to ventilation and wet state of coal.	Rainy.
Bombay -	1,830	Wishaw Coal, Lanark, (single screened).	Waggon	Ventilated	2 months	Ship burnt and abandoned.	Very showery.
Bombay -	—	- - - -	- - -	- - -	5 months	Fire, extinguished by water.	—
Bombay -	1,776	Splint coal from Scott and Gilmour's Collieries, Wishaw District.	Waggons	Ventilated	2½ months	To nature of coal which has fired in many vessels, and to accumulation of dust and small coal. Great heating.	Very dry.
Valparaiso -	720	South Wales smelting coal.	Waggons, 40 feet fall.	Ventilated	Nearly 2 months	Sulphur in the coal; heated, put into Rio.	Very fine and dry.
Matanzas -	660	Wishaw main coal -	Partly by hand	Partially ventilated with wood.	2 months	Cause unknown; fire -	Fine.
Calcutta -	930 part cargo.	- - - -	Waggon spout	Not ventilated	Over 2 months	Ship abandoned.	—
Batavia, Java	1,274	Langley Mill - -	By hand basket from barges.	Ventilated horizontally on each side of keelson and perpendicularly at each hatchway.	1 month	Bad quality of coal and damp condition.	Fine, a portion of coal taken in wet from barges.
Chili - -	720	Avon Vale coal (not screened).	Boxes, about 20 feet fall.	Cargo divided into 3 separate compartments.	14 days	Not ascertained; put into Rio and ship sold.	Dry.
Bombay -	1,600	- - - - -	Waggon, fall 20 feet.	Ventilated	3½ months	Height coals fell in loading; fire.	Showery.
Santos -	488	Merthyr Dare, ½ Grovesend, and Gelli and Cadoxton.	By spout	Not ventilated	2 months	Coal fresh wrought, wet, and of fiery nature; ship burnt.	Wet.
Odessa -	1,229	- - - -	Spout	Well ventilated.	10 days	Wetness of coal, and possibly proximity to boiler bulkheads; fire extinguished.	Wet.
Chili - -	650	Smelting coal, Mynhyddy	By boxes	Ventilated	2½ months	Coal small and wet -	Wet.
Java - -	600	Hamilton Coal Co., (double screened).	Wheeled on board.	Ventilated with iron.	3½ months	No cause attributed -	Fine and dry.
Aden - -	2,987	Insoles Merthyr and Steam coal.	Waggon	Ventilated	16 weeks	Not ascertained; partial damage.	Fine.
Galle - -	600	- - - -	- - -	Not ventilated	2½ months	No cause known; fire -	Dry.
Point de Galle	1,700	Townhill Colliery steam coal (double screened)	Waggon	9 fixed ventilators, besides plank ventilators.	Nearly 3 months	Coal coming fresh from pit; ship abandoned.	Fine and dry.
Constantinople	626	S. & W. Yorkshire pits (double screened).	- - -	- - -	2 months	Wet state of cargo; fire	Raining incessantly.
Calcutta -	1,170	Wishaw Ell coal (Lanark district (single screened).	Waggon	Through ventilation.	2½ months	Ventilation, and wet state of coal.	Very wet.
Rio - -	750	- - - -	Tips	Ventilated	2 months	Freshness of coal from pits; ship scuttled at Rio.	Fine and dry.
Calcutta -	1,955	Ell coal from Lanarkshire.	Waggon	Well ventilated.	7 weeks	Water getting in through side lights.	Wet during voyage.
Bombay -	1,441	Cowpen - - -	Waggon, 27 feet run, 26 feet fall.	Fairly ventilated.	Over 5 months	Dampness of coal; fired two days.	Fair, but wind and rain on voyage.
Bombay -	1,977	Howard's West Hartley best quality steam (double screened).	By spout	Ventilated	3½ months	Coals too fresh from pits, and not sufficiently screened; ship beached and scuttled.	Average weather.
Bombay -	1,664	Howard's West Hartley.	Tips and loading apparatus.	Well ventilated with Venetian shafts.	3 months	No information.	—
Valparaiso -	564	Alner smelting coal (unscreened).	Waggon, fall 30 feet.	Ventilated	Over 3 months	Wet state of cargo; fire	Very wet.

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TABLE II.

LIST of COAL-LADEN VESSELS which sailed from the United Kingdom for Foreign Ports during the year 1874 to which Casualties occurred through Spontaneous Combustion in the Coal.

Date of Clearance or Sailing.	Name of Vessel.	Owners.	Flag.	Tonnage.	How long built.	Wood or Iron.	Class.	Port of Loading.	Port of Destination.	Quantity shipped.	Description of Coal.	How loaded, Barrows or Tips.	Whether ventilated, and how.	How long Coal had been on Board.	Supposed Cause and Extent of Casualty.	Lives lost, so far as reported.	Weather when loading.
1874				Tons.						Tons.							
Feb. 11	Antigua	J. Kerr & Co.	British	643	16 yrs.	Wood	A1	Greenock	Cuba	910	—	—	—	—	—	—	—
Mar. 31	Lady Louisa	Wilson & Co.	British	542	9 „	Wood	A1	Cardiff	Shanghai	809	Powell Duffryn	—	Ventilated	181 days	—	—	—
April 22	Mogul	J. H. Sears & Co.	American	1,320	5 „	Wood	A1 America	Liverpool	San Francisco	1,555	Barnes's Lancashire	Tips	—	3 months	Total loss.	—	—
„ 29	Lucayas	T. O. Hunter	British	446	5 „	Iron	*A1	Dundee	Calcutta	680	Auldton Ell coal	—	—	4 months	—	—	—
„ 30	Lady Heathcote	J. Ransom	British	498	6 „	Wood	A1	Cardiff	Caldera	527	Insoles, No. 3 Rhonda	—	Ventilated	2 months	Total loss.	—	—
May 2	Centaur	Fletcher & Co.	British	1,212	10 „	Iron	*A1	Liverpool	San Francisco	1,310	Barnes's Lancashire	Tips	—	Over two months.	Total loss	16	—
„ 2	Noumea	Matthieu & Co.	French	1,155	12 „	Iron	*A1	Newcastle	Madras	1,530	Cowpen Hartley	—	Ventilated	115 days	Damaged.	—	—
„ 4	Anna	—	Dutch	969	—	Wood	—	Cardiff	Singapore	1,420	Insoles Merthyr steam coal, double screened.	Waggons, very slight fall.	Well ventilated	60 days	Cargo damaged; part thrown overboard.	—	Fine and dry.
„ 6	Unione	Vianello Bros.	Italian	560	6 „	Wood	3·3	Shields, N.	Callao	784	—	—	—	—	Damaged.	—	—
„ 8	Mary Goodell	W. McGilvery	American	761	20 „	Wood	5·6	Greenock	Rio Janeiro	998	—	—	—	—	Damaged.	—	—
„ 26	Androcles	—	Greek	288	—	—	—	Swansea	Odessa	406	—	—	—	—	Damaged.	—	—
June 1	John Elliot	J. Malcolm	British	1,198	9 „	Wood	A1	Dundee	Calcutta	1,706	Auldton steam coal	—	Well ventilated	3 months	Total loss.	—	—
„ 10	Susanna Johanna	von Zeylen & Co.	Dutch	1,145	15 „	Wood	A1 (red)	Newcastle	Acheen	1,600	Hartley coal	—	Ventilated	—	Total loss.	—	—
„ 10	Euxine	E. P. Bates	British	1,594	27 „	Iron	A1	Newcastle	Aden	2,062	Howard's West Hartley	Tips and shoot.	Iron permanent ventilators; wooden additional ones.	60 days	Total loss	4	Fine.
„ 12	Palmyra	W. Thompson	British	932	5 „	Wood	A1	Liverpool	Madras	1,206	Hartley steam coal	Tips	Ventilated	3 months	Damaged.	—	—
„ 12	Michael	P. A. Cocali	Greek	312	19 „	Wood	—	Swansea	Alexandria	483	—	—	—	—	Vessel sold.	—	—
„ 13	Maasluis	G. H. Uitden-Boogaardt.	Dutch	797	8 „	Wood	3·3	Newcastle	Acheen	1,160	Bower's West Hartley	—	—	—	Cargo heated.	—	—
„ 16	Oliver Cromwell	W. R. Price & Co.	British	1,112	8 „	Wood	A1	Newcastle	Aden	1,530	Howard's West Hartley	Tip	Thoroughly ventilated.	83 days	Nature of coal; total loss.	—	Fine.
„ 19	Eeta	W. & J. Smith	British	331	6 months	Wood	A1	London	Berbice	283	Swadlincote, 106 tons Baddersley 50 „ Babbington 96 „	Baskets	Well ventilated	38 days	Ship saved.	—	—
„ 22	Alexandre	A. Bordes	French	726	5 yrs.	Iron	*A1	Liverpool	Valparaiso	1,135	Lancashire best Orrell steam coal, double screened.	Waggon	Well ventilated	2 months	Damaged.	—	—
„ 22	Brenhilda	Hendry, Ferguson, & Co.	British	1,320	1 month	Iron	100A1	Glasgow	Calcutta	1,766	Ell coal	Waggon	Well ventilated	7 weeks	Coal too fresh from pits; cargo heated.	—	Very fine.
„ 26	Merchant	I. S. Tumulty	British	1,059	12 yrs.	Wood	—	Liverpool	Acapulco	1,448	N. Wales	—	—	—	Damaged.	—	—
„ 27	Moss Trooper	Ismay & Co.	British	510	10 „	Wood	A1	Liverpool	Valparaiso	685	Ince coal, 4 ft. seam	—	Well ventilated	3 months	Total loss.	—	—
„ 27	Admiral Fitzroy	Burgess & Co.	British	377	10 „	Wood	A1	Cardiff	Valparaiso	521	Insoles No. 3 Rhonda, worked from Cymmer colliery, and from No. 3 Rhonda seam, through and through.	Waggon	Cargo divided by deal boarding.	10 weeks	Total loss	—	Wet.
„ 27	Genitore	—	Italian	508	—	—	—	Hull	Odessa	830	—	—	—	—	Total loss.	—	—
„ 29	David Brown	P. Pendleton, jr.	American	905	10 yrs.	Wood	A1 Amer.	Cardiff	Singapore	1,233	Merthyr steam coal	—	—	—	Cargo heated.	—	—
„ 30	Calcutta	W. R. Price & Co.	British	1,372	10 „	Wood	A1	Newcastle	Aden	1,800	Howard's West Hartley	Tips	Thoroughly ventilated.	80 days	Nature of coal; total loss.	—	Fine.
July 2	Sierra Nevada	H. D. & J. Brookman	American	1,672	11 yrs.	Wood	3·3A	Liverpool	San Francisco	1,392	Barnes's Lancashire	Tips	—	40 days	Total loss.	—	—
„ 3	County of Perth	R. and J. Craig	British	1,626	1 month	Iron	100A1	Glasgow	Calcutta	1,617	Roughrigg's steam coal, double screened.	Barrows, fall 27 ft.	Well ventilated; wood and iron.	114 days	—	—	Dry.
„ 4	Waldridge (s.)	Clark & Co.	British	432	6 yrs.	Iron	A1	Sunderland	Cronstadt	850	—	—	—	—	Cargo heated.	—	—
„ 8	Pocahontas	W. Dixon	British	1,132	19 „	Wood	—	Newcastle	Bombay	1,579	Hastings Hartley	—	Well ventilated	65 days	Total loss.	—	—
„ 9	Willie S. Thompson.	R. Thompson	British	846	2 „	Wood	3·3L	Newcastle	Iquique	1,300	West Hartley	—	Ventilated	3 months	Total loss	7	—
„ 10	Camano	—	Italian	487	2 yrs.	Wood	3·3A	Liverpool	Odessa	807	—	—	—	—	—	—	—
„ 10	Dumbartonshire	T. Law & Co.	British	914	2 months	Iron	100A1	Glasgow	Buenos Ayres	530	Splint coal, Russell's colliery.	Barrows	Partially ventilated	2 months	Damaged	—	Good Weather.
„ 10	Workington	Hargrove & Co.	British	1,252	1 month	Iron	100A1	Port Glasgow	San Francisco	1,640	Splint coal, mixed. Woodside field, Hellfield, Loughor field, and Skellyton field.	—	Ventilated	50 days	Vessel and cargo sold.	—	—

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1874.																	
July 13	Industry	R. Robbins	British	1,138	16 yrs.	Wood	-	Newcastle	Bombay	1,455	Davidson's West Hartley steam coal from Bidlington colliery, probably low main seam, single screened.	Waggon and spout.	Carefully ventilated	98 days	Freshness of coal; total loss.	-	Fine and dry.
„ 13	Blair Athol	Thomson & Co.	British	1,697	1 month	Iron	100 A 1	Glasgow	Bombay	2,249	Watson's Hartley	-	Well ventilated	2½ months	Cargo heated.	—	—
„ 15	Mendora	Stoddart Brothers	British	970	9 yrs.	Wood	A1	Liverpool	Bombay	1,460	Tryddyn colliery, Coed Talon.	-	Ventilated	2½ months	Damaged.	—	—
„ 16	Staffordshire	D. Stuart & Co.	British	1,167	12 „	Iron	* A 1	Liverpool	San Francisco	814	Lancashire steam coal. White Moss coal, single screened.	From high level. Only slight fall.	Ventilated (wood)	100 days	Newness of coal; damaged.	-	Very fine.
„ 21	Victorine	Lequellec and Bordes	French	1,621	16 „	Comp.	-	Liverpool	Valparaiso	2,480	Orrell steam coal	Tips	Well ventilated	-	Cargo fired.	—	—
„ 22	Go-ahead	C. Ahrens	German	385	20 „	Wood	-	Liverpool	Constantinople	602	-	-	-	89 days	Damaged.	—	—
„ 24	Pelligrina	G. Mortola	Italian	319	13 „	Wood	-	Swansea	Piræus	521	-	-	-	-	Damaged.	—	—
„ 27	Alpha	Bath & Co.	British	397	10 „	Wood	A1	Swansea	Valparaiso	550	Rhonda, No. 3	-	-	2 months	Damaged.	—	—
„ 28	Glentilt	Hughes & Co.	British	991	9 „	Wood	A1	Cardiff	Coquimbo	607	Non-screened smelting coal, Penygraig colliery.	By shoot	Ventilated with platforms under cargo.	103 days	Inferiorquality, and damp state of coal.	-	Very fine and dry.
„ 30	Glory-of-the-Seas	J. H. Sears & Co.	American	2,102	5 „	Wood	A1 Amer.	Liverpool	San Francisco	2,100	Barnes's, Lancashire	Tips	-	-	Cargo heated.	—	—
„ 30	Ermenigilda Danovaro.	A. Danovare	Italian	813	19 „	Wood	5·6 A	Cardiff	Valparaiso	1,102	No. 3, Rhonda, (smelting coal).	-	-	-	Damaged.	—	—
Aug. 4	Laine	C. A. Berntedt	Russian	520	8 „	Wood	3·3 A	Hull	Athens	781	-	-	-	-	Vessel sold.	—	—
„ 6	Ontario	Stuckey & Co.	British	1,062	13 „	Wood	-	Shields, So.	Bombay	1,526	West Hartley, Main coal.	Tips	Well ventilated	5½ months	Damaged	-	Fine, but showery.
„ 6	Ascolta	F. Marciani	Italian	302	9 „	Wood	-	Hull	Constantinople	527	-	-	-	-	Total loss.	—	—
„ 10	Respigadera	Hargroove & Co.	British	1,629	1 month	Iron	20 (red)	Sunderland	San Francisco	1,974	Cowpen Hartley	-	Well ventilated	-	Damaged.	—	—
„ 13	Northbrooke	Adamson & Ronaldson	British	1,320	4 months	Iron	100 A1	Shields, No.	Madras	1,657	Cowpen Hartley, and Hastings Hartley.	-	Well ventilated	4 months.	Damp state of coal.	-	Changeable.
„ 13	New Lampedo	T. Seed	British	1,099	10 yrs.	Wood	A2 Amer.	Liverpool	Panama	1,499	Barne's, Lancashire	Tips	Deck ventilators fore and aft, grain lining left in 'tween decks.	3 months	Total loss	-	Very wet.
„ 14	Enthusiast	J. Ditchburn	British	283	20 „	Wood	A1	London	Demerara	193	Swadlincote, (single screened).	Basket	-	53 days	Total loss.	—	—
„ 15	Monmouthshire	D. Stuart	British	1,161	11 „	Wood	-	Liverpool	San Francisco	1,385	Barnes's, Lancashire	Tips	Well ventilated	6 weeks	Damaged.	—	—
„ 19	La Escocesa	Balfour & Co.	British	946	6 „	Iron	A 1	Cardiff	Valparaiso	1,453	No. 3, Rhonda	Tips	Well ventilated. (Venetian ventilators).	130 days	Coal green and wet, damaged.	-	Raining heavily.
„ 24	Clothilde		Italian	568	-	-	-	Cardiff	Valparaiso	751	Rhonda, No. 3	-	-	-	Total loss.	—	—
„ 29	St. Nicholas	Chapman & Flint	American	1,796	5 „	Wood	3/3 A	Liverpool	San Francisco	2,015	Brancker's, Pemberton coal.	Tips	Ventilated and platformed.	3½ months	Damaged.	—	—
About end of Aug.	Skandia	-	Fin	281	-	-	Wood	-	Gloucester	Copenhagen	250	-	-	-	6 weeks	Vessel damaged.	—	—
Sept. 4	Try	W. and J. Wright	British	428	„	Wood	A	London	Demerara	107	57 tons Swadlincote 50 „ Stockley Hall	Basket From craft.	Probably (not certain).	60 days	Cargo heated.	—	—
„ 5	Crystal	W. and J. Wright	British	263	2 „	Wood	A1	London	Berbice River (New Amsterdam).	239	136 „ Swadlincote 102 „ Stockley Hall	Basket From lighter.	Ventilated	80 days	Cargo heated.	—	—
„ 15	Khersonese	G. Duncan	British	1,710	19 „	Iron	100 A 1	Newcastle	Bombay	2,000	Bebside West Hartley, double screened.	-	Well ventilated	160 days.	—	—	—
„ 18	P. J. F. Burchard	L. Burchard and Son	German	459	13 „	Wood	-	Leith	Monte Video	720	Splint coal.	—	—	—	—	—	—
„ 19	The Foundling	E. Bates	British	1,185	8 „	Iron	A 1	Liverpool	Bombay	1,281	Mixed:—795 tons Westminster Brymbo; 306 tons Oak Pits coals; 200 tons coke.	Tip and shoot.	Permanent iron ventilation; additional wooden ones.	2 months	Total loss	-	Wet.
„ 28	May Queen	Thompson	British	1,055	12 „	Wood	A1	Newcastle	Rangoon	1,415	Cowpen Hartley	-	-	153 days	Total loss.	—	—
„ 29	Chili	-	French	1,441	-	-	-	Liverpool	Valparaiso	2,000	Orrell steam coal	Tips	Ventilated	3 weeks.	—	—	—
Oct. 2	Eugenie	-	German	734	-	-	Iron	Liverpool	Valparaiso	860	-	-	-	-	Damaged.	—	—
„ 3	Levant	Jones & Co.	British	314	8 „	Wood	A1	Swansea	Valparaiso	470	Smelting coal; not screened.	Waggon, 20 ft. fall.	Ventilated with wood.	100 days	Damaged	-	Partly wet.
„ 5	Tilde	A. Poschich	Austrian	636	10 months	Wood	A1	Hull	Maulmain	869	—	—	—	—	—	—	—
„ 16	Fedalma	Scrutton, Sons & Co.	British	478	5 yrs.	Iron	* A 1	Porthcawl	Valparaiso	654	Smelting coal from the "Aber Coal Co.," not screened.	Tip	Cargo was divided fore and aft by stanchions from deck to keelson, and ½-inch boards nailed to them, thus leaving space 6 inches broad from top to bottom, dividing the whole cargo in the middle.	-	Fire; slight damage.	-	Fine and dry.
„ 23	City of Richmond	D. Kennedy	British	1,241	10 yrs.	Wood	-	Liverpool	Bombay	1,638	Laisols' West Hartley, double screened.	Tip	Well ventilated and platformed.	142 days	Cargo in state of combustion.	—	—

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TABLE III.

LIST of COAL-LADEN VESSELS which sailed from the United Kingdom for Foreign Ports during the Year 1875, to which Casualties occurred through Spontaneous Combustion in the Coal.

Date of Clearance or Sailing.	Name of Vessel.	Owners.	Flag.	Tonage.	How long built.	Wood or Iron.	Class.	Port of Loading.	Port of Destination.	Quantities shipped.	Description of Coal.	How loaded, Barrows or Tips.	Whether ventilated and how.	How long Coal had been on Board.	Supposed cause and extent of Casualty.	Lives lost, so far as reported.	Weather when loading.
1875 March 9	Quatters Fratelli	Dillorto Frères, Genoa	Italian	500	6 years	Wood	3/3 A.	Cardiff	Callao	790	270 tons of Rhondda, No. 3; 511 of tons Aber Rhondda, No. 2.	-	-	-	Fire; vessel damaged; cargo sold.	—	—
„ 18	Independensa	G. Lisario, Malta	Italian	505	18 „	Wood	-	Cardiff	Valparaiso	860	Aber Rhondda, No. 2	-	-	-	Cargo much heated.	—	—
April 24	Angelo Antonio	E. Razetto, Genoa	Italian	596	5 „	Wood	-	Liverpool	Callao	900	Best Orrell coal	-	-	9 weeks	Burnt; total loss.	—	—
„ 27	Pilgrim	H. Hastings, Boston, U.S.	American	1,050	1 „	Wood	1 Amer.	Shields	Hong Kong	1,404	Cowpen's West Hartley	By spout	Ship ventilated fore and aft; no ventilators for cargo.	Nearly 5 months.	Fire under main hatch; slight damage.	-	Fine.
May 13	Antelope	B. McNear & Co., Boston, U.S.	American	1,306	2 „	Wood	3/3 L.	Clyde	San Francisco	1,273	Lanarkshire hard splint coal from Mr. John Watson's pits.	-	-	Nearly 5 months.	Took fire whilst discharging; vessel damaged.	—	—
June 3	Frankfurt Hall	W. P. Coleborn, 2, Tower Chambers, Liverpool.	British	728	6 „	Iron	*A 1	Liverpool	Valparaiso	602	Shippers state steam coal from Tawd Vale Colliery, 7-ft. seam. Double screened.	Wagon	Eight mooring bitts constructed as ventilators, and three large open galvanised iron ventilators.	Nearly 4 months.	Fire; cargo damaged.	-	Fine and dry.
„ 5	Helen Morris	C. T. Child & Co., New York.	American	1,285	7 „	Wood	1 Amer.	Shields	San Francisco	1,650	Cowpen West Hartley steam coal.	-	-	Nearly 6 months.	Burnt; total loss.	—	—
„ 8	Senator	-	American	-	-	Wood	-	Philadelphia	Panama	1,600	-	-	Ventilators below the hatches.	3 months	Burnt; total loss.	Two	—
„ 8	Willem Poolman	Van Zeyland & Co., Rotterdam.	Dutch	1,244	9 years	Wood	A	Shields	Java	1,600	-	-	-	-	Burnt; total loss.	—	—
„ 18	Araeana	G. N. Roberts, St. John's, N.B.	British	1,192	13 „	Wood	2¹ Amer.	Liverpool	Bombay	1,756	-	-	-	4 months	Burnt; total loss.	—	—
„ 20	Aurelie	Etienne Michou, Quebec.	American	546	6 „	Wood	L 11 Veritas	Liverpool	Barbadoes	701	Bituminous steam coal	-	Ventilated by hatches; no ventilators for cargo.	6 weeks	Burnt; total loss.	-	Fine.
„ 25	Clevedon	E. C. Friend, 2, Tower Chambers, Liverpool.	British	698	7 „	Iron	*A 1	Liverpool	Valparaiso	1,037	Shippers state steam coal from Tawd Vale and Crow Orchard Collieries. 7-ft. seam. Double screened.	250 tons by by lighter rest by boxes from tips.	Eight mooring bitts constructed as ventilators, and three large open galvanized iron ventilators through deck.	3 months	Burnt; total loss.	-	Fine while loading, heavy weather off Cape Horn.
„ 30	Martin Wienert	J. Johnasson, 5 Gloucester Sqre., London.	British	506	3 „	Iron	90 A 1	Shields	Mühlgraben	1,048	Bebside screened Hartley steam coals.	From wagon by spout.	All holds and other parts of vessel ventilated by several metal pipes carried above deck and having swan necks.	A week	Fire; slight damage; part cargo jettisoned.	-	Good weather.

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July 10	Dominicho Galliano.	Galliano Fils, Genoa	Italian	537	10 yrs.	Wood	3,3 A	Cardiff	Singapore	812	Large steam coal	- - -	- -	3 months	Fire; vessel much damaged.	—	—
„ 16	River Boyne	J. Hargrove, Hargrave's Buildings, Chapel St., Liverpool.	British	499	8 „	Iron	*A1	Liverpool	Valparaiso	766	Orrel coal	- - -	Hatches, &c. forward and aft.	3 months	Fire; part cargo jettisoned.	—	—
„ 25	Powhattan	G. Meager, Swansea	British	399	9 „	Wood	A1	Swansea	Valparaiso	580	Smelting, Trycher, through and through.	Shoot	Ventilated bulkhead to bulkhead with deals from keelson to deck.	11 weeks	Cargo heated; part jettisoned.	- -	Very fine.
Aug. 14	Beucleugh	W. Thomson, Alloa	British	1,350	4 months	Iron	100 A1	Greenock	Bombay	1,781	Watson's Hartley	By wagon and steam crane.	In addition to ventilation suitable for emigrant trade she had four wooden venetianed ventilators down to ceiling.	3 months	Fire; part cargo jettisoned.	- -	Wet weather.
Sept. 18	Aberaman	Capper & Alexander, Cardiff.	British	1,090	6 „	Iron	100 A1	Shields	Bombay	1,620	Cowpen Hartley steam coal, single screened.	Tips	Ventilated through masts, bitts, &c., and iron ventilators both ends of ship with cowls.	4 months	Cargo much heated, almost on point of ignition.	- -	Fine.
„ 25	Theresa	B. French, 44, Castle St., Liverpool.	British	704	18 yrs.	Wood	5/6 L. 11 in Veritas.	Birkenhead	Rangoon	920	Chill Colliery Co., Thurstall, Staffordshire.	From tips	Excessively ventilated; square venetianed deal ventilator in each hatch to keelson, and a trunkway on each side of keelson, and three rose-mushroom ventilators in each hatch.	2½ months	Burnt. Total loss.	- -	Part of the time raining.
Oct. 10	Le Baron	J. W. Paynter, Liverpool.	British	907	5 „	Wood	- - -	Hull	Valparaiso	1,378	Steam coal of second class. West Riding screened Hartley, Messrs. Pope & Pearson's pit near Normanton.	- - -	- - -	- - -	Burnt. Total loss.	One	Fine.
„ 16	Patmos	Lunt Bros. & Co., Newbury Port, U.S.	American	738	16 „	Wood	1¹ Amer.	Hull	Valparaiso	- -	Steam coal second class. Featherstone's Main Hartley Colliery.	- - -	- - -	- - -	Burnt. Total loss.	—	—
—	Utrecht	Van Zeyland & Dreker	Dutch	1,873	7 „	Wood	A1	Newcastle	Batavia	- -	- - - -	- - -	- - -	2 months	Fire; jettisoned part cargo.	—	—
—	Mabel	C. Hill & Son, Bristol	British	429	2 „	Wood	A1	Porthcawl	Caldera	647	Through and through smelting coal.	Tip and shoot.	Boarded longitudinally from keelson to upper deck having space between, also platform 14 or 15 inches high.	3 months	Fire; slight damage.	- -	Variable.
Sept. 18	San Rafael	Balfour, Williams, & Co., Liverpool.	British	955	13 „	Wood	A1 Amer.	Liverpool	Valparaiso	1,300	- - - - -	- - -	A ventilator in each hatch.	3 months	Burnt. Total loss.	Ten	Fine and close.
—	Fanny	H. Holmes, Bishopswearmouth.	British	396	12 „	Wood	A1	Porthcawl	Valparaiso	- -	- - - -	- - -	- - -	Not known; (casualty occurred 28th Dec. 1875.	Fire; great damage.	—	—
Dec. 26	John Clarke	- - - -	American	1,079	19 „	Wood	1¹ Amer.	Liverpool	Bombay	1,343	- - - -	- - -	- - -	4½ months	Fire.	—	—

† This vessel sailed again 31st August from the Tyne for Hamburg with coal, and was published as missing in Lloyds' List of 7th October. In Lloyds' List of 9th September a report appears of a lifeboat belonging to this vessel having been picked up off the Doggerbank, and in Lloyds' List of 10th September there is a paragraph stating that it was reported that an explosion had taken place causing her to founder, and that there were 22 hands on board.

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TABLE IV.

List of Coal-Laden Vessels posted at Lloyd's as Missing, having sailed from the United Kingdom during the years 1874 and 1875 on over-sea Voyages.

Date of Sailing.	Vessel.	Tonnage.	Voyage.		Date of Lloyd's List when posted as Missing.
1874.					
January 17	Sidra (s)	923	Shields	Port Said	March 26, 1874.
February 1	Pilgrim	182	Mostyn	Santander	May 7, 1874.
„ 3	Lydia	100	Ayr	Malaga	July 30, 1874.
„ 6	Alejandro	436	Newport	Hong Kong	December 3, 1874.
„ 6	Alida	313	Liverpool	Buenos Ayres	Part coal.
„ 6	George Duckles	172	Liverpool	Lagos	September 24, 1874 (part coal).
„ 7	Eliza Thornton	429	Cardiff	Cadiz	August 20, 1874.
„ 9	Zelie	172	Cardiff	Bordeaux	May 7, 1874.
„ 9	Anna	75	Liverpool	Reikjavik	July 30, 1874 (part coal).
March 18	Maria	197	Tyne	Stockholm	July 9, 1874.
„ 20	Forest King	1,085	Newcastle	Rio Janeiro	September 24, 1874.
„ 24	Sea Queen	372	Liverpool	Genoa & Rio Janeiro	July 30, 1874.
„ 31	Rhuma	138	Liverpool	Lisbon	July 9, 1874.
April 1	Everdina	212	Sunderland	Stockholm	August 13, 1874.
„ 2	Franklyn	284	Peterhead	Iceland	August 6, 1874.
„ 4	Freak	99	Shields	Cadiz	July 30, 1874.
„ 6	Raven	101	Cardiff	Lisbon	October 8, 1874.
„ 7	Speedwell	668	Cardiff	Malta	August 13, 1874.
„ 7	Myrtle	417	Sunderland	Palermo	August 13, 1874.
„ 8	Atlantic	996	Liverpool	Aden	November 12, 1874.
„ 8	Eliza Forbes	149	Tyne	Stralsund	July 16, 1874.
„ 9	May Queen (s)	577	Tyne	Carthagena	May 28, 1874.
„ 9	Hyaline	171	Newcastle	Guadeloupe	December 3, 1874.
„ 10	The Barton (s)	417	Greenock	Licata	June 11, 1874.
„ 11	Pontiac	1,050	Sunderland	Bombay	December 10, 1874.
„ 12	Jules de Rontaunay	437	Cardiff	Bahia	November 12, 1874.
June 17	North Glen	499	Liverpool	Caldera	March 11, 1875 (part coal).
July 13	Eastern Star	340	Troon	Singapore	April 1, 1875.
„ 15	Maypocho	699	Liverpool	Valparaiso	March 4, 1875.
August 15	Carmainia	729	Liverpool	Valparaiso	March 25, 1875.
September 23	Isabella Kerr	1,415	Greenock	Bombay	May 20, 1875.
October 13	Nora Graeme	1,001	Liverpool	Bombay	June 3, 1875.
„ 16	St. Mirren	526	Troon	Demerara	February 25, 1875 (part coal).
November 7	Romeo	210	Granton	Berbice	April 9, 1875.
„ 20	Anna	157	Cardiff	Villafranca	July 8, 1875.
„ 27	Success	474	Liverpool	Shanghai	September 2, 1875.
„ 28	Solide	294	Cardiff	Port Mahon	May 14, 1875.
„ 30	Ann Mitchell	189	Cardiff	Bari	April 22, 1875 (part coal).
December 5	Alice (s)	627	Cardiff	Constantinople	March 18, 1875.
„ 5	Alfred	79	Swansea	Granville	March 11, 1875.
„ 15	Argosy	394	Shields	Mauritius	August 5, 1875 (part (coal).
„ 31	Marmion	292	Tyne	Buenos Ayres	July 8, 1875.
1875.					
January 10	Hans Christen Orsted	163	Tyne	Messina	May 27, 1875.
„ 22	George Batters (s)	714	Porthcawl	Gibraltar	March 18, 1875.
June 7	Lothair	859	Liverpool	Valparaiso	June 29, 1876.
July 27	Rosewood	276	Troon	Matanzas	December 30, 1875.
August 31	Martin Wiener (s)	755	Tyne	Hamburg	October 7, 1875.
September 24	Mette	91	Tyne	Korsoer	December 16, 1875.
October 26	Acapulco	598	Liverpool	Valparaiso	June 15, 1876.
November 8 (Yokahama Roads)	Yokohama	154	Tyne	Rotterdam	January 18, 1876.
November 9	Cavalier (s)	115	Swansea	Nantes	December 16, 1875.
„ 15	Lousitania	206	Newcastle	Oporto	March 2, 1876.
„ 20	Benton	952	Birkenhead	Bombay	July 6, 1876.
December 3	Magic	180	Tyne	Lisbon	March 9, 1876.

This List is made up to July 6th, 1876; but there may be other Vessels posted as Missing during the remainder of the year 1876, which had sailed in the year 1875.

Vessels with Patent Fuel not included in the List.

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APPENDIX VI.

Form of Specification for Coal Cargoes.

* Specification (in lieu of Shipping Bill and Customs Bill of lading) for *British and Irish* goods only.†

Port of _____ In the ship_____ _____Master, for_____

* The Specification of Goods exported must be delivered to the proper Officers of Customs within six days from the time of the final clearance of the ship, as required by the 23 Vict. cap. 22.

† The Goods must be described in accordance with the denomination in the Official List of British and Irish Produce and Manufactures exported.

Marks.	Numbers.	No. and Description of Packages.	Quantity and Description of Goods.	Value.
			Total -	

I declare that the particulars set forth above are correctly stated.

Date _____ 187 . Exporter or Agent_____ Address _____

G O $\frac{139}{1870}$ and $\frac{11}{1873}$.

APPENDIX VII.

Selected Correspondence.

(*a.*) Letter from Mr. Charles Icely, R.N., on Combustion of Coal in Plymouth Gasworks.

8 Hyde Park Terrace, Mutley,

Sir, near Plymouth, 1st April 1876.

In accordance with the wish of the Commission for a report in regard to the case of spontaneous combustion at the Plymouth Gasworks, which manifested itself actively during the month of February last, I beg to submit the following statement as the result of my observation on the spot, together with information given by Mr. Browning, the engineer of the works. There are at these works six coal stores, two of which are severally 116 feet 6 inches long, 66 feet broad, and 26 feet in height, and will contain each 4,750 tons. The remaining ones, which are smaller, vary in capacity. The whole of them will contain in the aggregate 13,000 tons.

On the occasion of my visit the smaller ones were clear of coal, and the two larger (which are contiguous) were about two-thirds empty, but still containing from 700 to 800 tons each, represented by heaps 26 feet in height. The coal in both was in process of combustion, and presented this singular feature, "That the fire was mainly confined "to a stratum about 18 inches wide, and this at a height "of 10 feet from the basement, traversing the heap "laterally, and identical in height and width in both "stores, although a stone partition wall two feet in "thickness divided them." There were inconsiderable patches of fire (if they may be so termed) in other parts of these heaps above this *belt*, but none that attracted my attention at this time below it.

I elicited from Mr. Browning that it had been the custom of the Company for some years past to keep the stores filled up by a continuous supply during the summer months, while freights were low, and that in consequence a great portion of the coal would be stored from five to six months before being required for use. In such case it invariably heated, and year after year it had been his experience, when digging into the mass, to discover combustion more or less advanced. He had observed, too, on these occasions, that in places where the combustion was in its incipient stage the new supply of air rendered by the turning over of the coal soon induced activity.

To show the inertness of water in extinguishing fire of this nature, he drew my attention to isolated heaps of coal in other parts of the store, of from one to two tons, then smouldering, which he assured me had been well damped with water a week previously.

The coals usually bought by the Plymouth Company are of three varieties, viz. :—Peareth, Pelaw Main, and New Pelton. Mr. Browning was of opinion that "Peareth" was in the largest quantity in this case.

The large heaps in which the fire was present were closely lying masses of small coal. A sample was found to be very friable, and largely impregnated with iron pyrites.

Viewing the facts of this case as herein narrated, they appear to be fairly confirmatory of the evidence already before the Commission, viz :—"The danger accruing from "long storage of finely divided coal of certain classes."

"The manifest tendency the so-called through ventila-"tion would have in favouring the development of heat "in such coal," and,—

That water when poured on the surface of a body of coal that has spontaneously ignited, though it may arrest the progress of the fire, does not effectually quench it.

In view also of the tenacity with which spontaneous fire seems to cling to the combustible substance of coal, I submit with much deference, for the consideration of the Commission, that if the contemplated steam experiment for dealing with an artificial fire proves successful, a further trial of its efficacy should be made (if practicable) on a mass of coal under the altered conditions of spontaneous ignition.

I am, &c.

Chas. Icely.

J. M. Carmichael, Esq.

(*b.*) Letter from Professor Ferguson on Chemical Analysis of Coal.

The following is a letter from Mr. Ferguson, Professor of Chemistry at Glasgow University, giving the results of his examination of four samples of coal submitted to him, and at the same time expressing his opinion that conclusions obtained from such limited experiments should not be relied upon.

The samples submitted to him were "Hamilton Ell," "Watson's Ell," "Russell's Splint," and "Roughrigg coal." "Hamilton Ell" and "Watson's Ell," or "Hartley" as it is sometimes called, would represent the cargoes shipped in the "County of Nairn," "Walter Bain," "Isabella Kerr," "Lucayas," "Brenhilda," and "Blair Athole," but it was stated by those supplying the samples that they would show a greater proportion of pyrites than would be found in the mass, although pyrites would be found to a greater or less degree in all Ell coal.

University of Glasgow,

Dear Sir, May 16th, 1876.

In reply to your favour of the 15th inst., I beg to send you the results of my examination of four samples of coal furnished me by Mr. John Ferguson of Whiteinch. You will observe that I have confined my examination to the general composition of the coals, in so far as that seemed to me to bear on the question of spontaneous combustion. No. 1. is Ell coal from the Hamilton Coal Company: No. 2 is Ell coal from J. Watson; No. 3 is Ell coal from Roughrigg; No 4 is Russell's Splint. The numbers express percentages.

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	No. 1.	No. 2.	No. 3.	No. 4.
Moisture - - -	8·15	6·55	1·60	6·30
Ash - - -	19·50	17·20	2·90	7·20
Coke - - -	59·24	55·88	67·10	57·12
Sulphur (total) - -	14·66	10·84	—·809	—·589
Iron - - -	5·68	5·42	Trace.	Trace.
„ pyrites - -	12·17	11·61		

Nos. 1 and 2 accordingly contain much pyrites, indeed the mineral was quite apparent in the coal; Nos. 3 and 4 are practically free from pyrites.

In order to ascertain to what extent the pyrites in the coal undergoes oxidation, I made one or two experiments, with the following resuls. Portions of the coals were taken and the amount of oxidized sulphur (assumed to be sulphuric anhydride— OS_3 —entirely) present estimated. The coals were then spread out to the air, one part being kept dry, another being moistened from time to time. Portions of these were taken at intervals and new detertions of SO_3 in them made. The numbers again denote per-centages.

——	No. 1. SO_3.	No. 2 SO_3.	No. 3. SO_3.	No. 4. SO_3.
In original sample at 21st December 1875.	—·198	—·218	Nil.	Nil.
After exposure, moist, till 21st January 1876.	—·280	—·346	—	—
After further exposure till 24th January 1876.	—·308	—·390	—	—
After exposure, dry, till 21st January 1876.	—·311	—·307	—	—
After further exposure till 24th January 1876.	—·342	—·350	—·034	—·099

A portion of No. 2 was also kept in air for a week at a temperature of 104° Fahr., at the end of which time the SO_3 amounted to —·548.

These numbers, if they are of any value at all, (for in an experiment on so small a scale and for so short a time the smallest accidental circumstance might produce considerable variations and anomalies, which could be got rid of only after many repititions,) show that the oxidation was most rapid at first. Thus No. 1 in the dry state increased at first from ·198 to ·311, that is, by ·113; afterwards it increased from ·311 to ·342, or by ·031 only, and similarly with all the others. It is observable that No. 1 moist oxidized less rapidly than when dry, whereas No. 2 oxidized at first more rapidly than when dry. The results therefore with regard to dampness of the coal are contradictory. The oxidation of the pyrites appears to go on slowly and at a diminishing rate. The only other inference that forces itself upon us is, that if all four are samples of coal which have caught fire spontaneously, it can hardly have been due to the oxidation of pyrites alone, seeing that No. 3 and 4 are free from that substance.

My opinion is that conclusions of any worth could be arrived at only after very many experiments on different kinds of coal, placed under varying conditions of temperature, &c., and that great care is requisite in interpreting the results of two or three experiments like the above. The next point to examine is the extent to which the carbon and hydrogen of the coal itself undergo slow oxidation, and whether spontaneous combustion be not due to that action.

I am, &c.

J. M. Carmichael, Esq. JOHN FERGUSON.

(*c.*) LETTER from Mr. POOLE, INSPECTOR of MINES, NOVA SCOTIA.

Halifax, Nova Scotia,

SIR, January 12th, 1876.

IN accordance with the request conveyed in your letter of August 3rd, 1875, I have the honour to forward you the following information on the subject before the Commission, to be submitted, should it meet with your approval, before the Royal Commission on the Spontaneous Combustion of Coal at Sea.

I am happy to be enabled to give, besides the results of my own observations, information bearing on the subject from several gentlemen of the United States. I am more particularly indebted to Estes Howe, Esq., M.D., President of the Cambridge Gaslight Company, for his assistance in obtaining the opinions of others. He has sent me the accompanying paper (I.) read before the New England Association of Gas Engineers, in February 1875, by J. H. Armington, Esq., Superintendent of the Brooklyn Gas Company.

II. A statement, with a diagram, from Mr. Lees, President of the New York Gas Company.

III. A letter from the Hon. Knowlton S. Chaffee on the Spontaneous Combustion of Charcoal.

IV. Is Dr. Howe's own statement.

V. A statement of R. C. Adams, Esq., of Montreal, on the heating of Nova Scotia coals in the sheds at Montreal and Quebec.

VI. A letter from W. W. Greenough, Esq., Treasurer of the Boston Gaslight Company, on the Spontaneous Combustion of Albertite.

On my own part, I will first refer to the coals of this province, which are all bituminous, and which may be classified according to the two chief districts in which they are mined, Pictou and Cape Breton, into non-caking and caking coals. The following analyses may be taken as typical of their composition:—

	Pictou.	Cape Breton.
Volatile matter -	30·48	33·44
Fixed carbon -	61·23	62·32
Ash - -	8·29	4·23
	100·00	100·00

The per-centage of sulphur in the Pictou coals varies from ·26 to 1·68; an average of seven analyses gives ·72 per cent. The quantity contained in Cape Breton coals is greater; an average of fourteen analyses gives 2·05 per cent. of sulphur.

The Pictou coals are harder, and stand handling and transportation better than those of Cape Breton. They are chiefly used for steam purposes, and so far as is known they have never heated, either in store or on board ship. The quantities exported south of the equator have been very small: 4,388 tons in 1874, 753 tons in 1873, and 1,600 tons in 1875. Large quantities have, however, been stored for months in the chief towns of New England, and in Montreal and Quebec, and in no case is the coal known to have heated to any extent.

The same cannot be said of the Cape Breton coals, which are more friable than those of Pictou, and cases of spontaneous combustion are known to have occured with some of these coals. They are nearly all caking coals, and suitable for gas manufacture, though many or all find some service as steam and domestic coals. The quantities sent south of the equator have been small: 1,132 tons in 1873, 688 tons in 1874, and 3,446 tons in 1875.

A cargo of 1,000 tons, unventilated, arrived in good order at Singapore.

The general practice of the country during the winter months, when the ports are closed and shipping prevented by ice, is to bank the coal mined in heaps of ten, twenty, and even forty thousand tons, to a height of 18 to 25 feet. In no case has heat been known to have been generated in these banks, although some of them have not been all lifted until late in the autumn. As a confirmation of the absence of a great increase of temperature, it has often been noticed that when the coal has been negligently dumped over snow, ice is found in the heap even late in the summer. As, however, many coals so heaped do slack even in the centre of the banks, I suspect a slight increase of temperature does take place at some period. I shall suggest that tubes be inserted, and the temperature at several places in some heaps be taken and compared with the average of the atmosphere. At some mines the coal banked is first riddled in the pit, at others

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the duff is not removed, and the opinion of some managers is, that the per-centage of screenings is as large from that which has been riddled as from that which has not been riddled; in other words, that the deterioration is diminished by leaving the duff with the coal. Heating has been observed in piles of slack coal that have been accumulated during the summer for the use of the engines during the winter, when the season has been showery, but not when it has been dry. A pile of 3,000 tons of coarse coal of the same seam was kept in sheds for three years without heating. A heap of screenings 19 feet high, 250 feet long, and averaging 33 feet wide, collected within a couple of months, took fire within two months after being completed. Smoke was first observed on the side of the heap some 6 feet from the bottom. On shovelling away the surface layer, 6 inches thick, a crust a foot in thickness was found underneath, which, on being disturbed, broke into flames. A similar heap on drier ground, but four times as long, and slowly accumulated, never heated.

A cargo of coal from another seam which has never heated in the pit banks, was discharged on a wooden wharf at Boston, where air played over, under, and round it, and took fire within a very few weeks.

Mr. Adams, in Appendix V., describes the circumstances of cases of spontaneous combustion at Montreal and Quebec, and shows that fires occurred in positions similar to both the cases mentioned by Mr. Armington, at Brooklyn and Troy, in the fine, compact, and damp coal directly under the dump, and in the coarse coal with freer ventilation, as Dr. Howe confirmed in his statement. Mr. Lee's diagram shows how very local the origin of a fire may be, and Mr. Armington mentions a similar case, though it is evident there is at the same time a general elevation of the temperature of the mass. Dr. Howe and Mr. Armington agree that the best American gas coals, containing less sulphur than our provincial coals, are just as liable to spontaneous combustion. Messrs. Perkins and Job of Boston and New York, who have been in the coal trade for over 30 years, hold similar views, and further state that they do not know of one case of fire at sea in a vessel laden with Nova Scotia coal. The heating of the Cumberland coal of Maryland in the dockyard of Halifax, and its ignition at Bermuda, prove that that excellent steam coal is not free from danger. The heating of the albertite, which is entirely free from sulphur, was thought to be due to the absorption of oxygen, as in the case of charcoal, but a doubt has been raised since it has been shown that 5 per cent. of the shipments consist of bituminous shale (the walls of the vein from which the albertite has been extracted by heat and pressure), which are said to contain a small per-centage of sulphur. The per-centage, however, is so small that it is hardly sufficient to account for the general heating observed.

The loss of the barque "Senator," in October 1875, was stated to be due to the spontaneous combustion of semibituminous coal, but inquiries disclosed that besides the 1,200 tons of Broadtop semibituminous coal, she carried 400 tons of small Charfield bituminous, which was taken on board in wet weather. She was ventilated. Respecting anthracite, Major Morris, of the Reading railway, writes, he has loaded a large number of vessels up to 2,000 tons capacity with anthracite for Chili, San Francisco, Japan, &c., and in no case were precautions taken or proved to be in future necessary. The Hon. S. Sloan, President of the Delaware, Lackawanna, and Western Railway confirms the opinion that there is no necessity for care against fire with anthracite. Dr. Howe, in his statement, points out the opinion of the workmen, that all coal heaps pass through a heating process. I would remark in connexion with this, that this stage must be slight in the heaps of fresh mined coal, as it has not hitherto been noticed, but that it appears to be developed when the coal is turned over and wetted, just as heaps of pyrites and decaying vegetable matter. Regretting that the information on the matter at my command is not more specific and relevant in character,

I have, &c.
HENRY S. POOLE, M.A., F.G.S., &c.
Inspector of Mines for Nova Scotia.

The Rt. Hon. HUGH C. E. CHILDERS, M.P.,
Chairman of the Royal Commission
on the Spontaneous Combustion of Coal at Sea.

I.

A PAPER read before a MEETING of the NEW ENGLAND ASSOCIATION of GAS ENGINEERS, February 1875, by Colonel J. H. ARMINGTON.

During the month of December 1874 it was discovered that the coal stored in the coal sheds of the Brooklyn Gaslight Company was on fire. It has been the practice for many years at these works to introduce gas tubing, 1½ inches in diameter, in the various piles of coal, in order that the temperature should be known, and a daily record made of it. In this way a careful watch has been kept, and whenever the temperature changes it has been immediately noticed, and the necessary steps taken to prevent further danger, by at once using the coal showing the extra heat. The coals purchased by this Company during 1874 were supposed to be so free from sulphur and iron that the tubing was not introduced, and consequently the high temperature was not known until that particular odour was noticed which is always given off when spontaneous combustion occurs in gas coals. At the same time that the peculiar odour was apparent, smoke appeared in the shed, and operations were at once commenced to find the fire. After three days and nights of continual labour, and the removal of about 900 tons of coal, the fire was discovered to have taken place in a pile of Penn coal; and, when reached, it proved to be confined to a space of less than 12 feet in diameter and 4 feet in height. The entire mass was so thoroughly baked together that it had to be broken in pieces with bars in order to remove it. After removing it from the shed it was piled in a heap on the wharf, and in a few minutes after being exposed to the air the whole mass was in a blaze. Only two instances of this kind have ever come to the knowledge of the writer, of spontaneous combustion in our domestic coals; and I believe it is the general opinion of gas engineers that no danger is to be apprehended from stowing these coals in piles of the ordinary height that we are accustomed to see about the gasworks in this country.

The first instance of this kind that came to my knowledge occurred in Troy, N.Y., and the cause was said to have been from its being so solidly packed, the fire having taken place directly underneath the dumping hatch of the coal shed. The other was in the works of the New York Gas Company, and the cause of this fire I have never heard stated. The fire in the shed of the Brooklyn Gas Company commenced between the tracks, and in that portion of the coal which rolled from the piles when it was dumped, on each side of it; it must therefore be evident to us all that this fire could not have occurred from the same cause as that mentioned in the coal sheds at Troy.

From whatever cause the fire did proceed (and in this case I am unable to give any satisfactory reason for it), it shows us that there is danger of spontaneous combustion in our coal stores, and that the necessary precautions should always be taken to discover any overheating which may be likely to recur. Having been asked how the pipes are prepared in which the thermometers are inserted, I will state, that in one end of a pipe a solid pointed plug is welded to close the end and to better adapt the pipe for being driven down through the coal; above this plug a dozen or more holes, ½ inch in diameter, are then drilled, giving the necessary openings for the air to enter.

The temperatures, which are taken regularly, vary from day to day, and are always found to be higher than the atmosphere. By an examination of the tables of temperature accompanying this paper, it will be seen that this variation is very great, and proceeds from some cause which is well worthy of our consideration.

During the past week it was discovered that the temperature was rising in a pile of Newcastle coal, and when the thermometer indicated 200° men were set at work to

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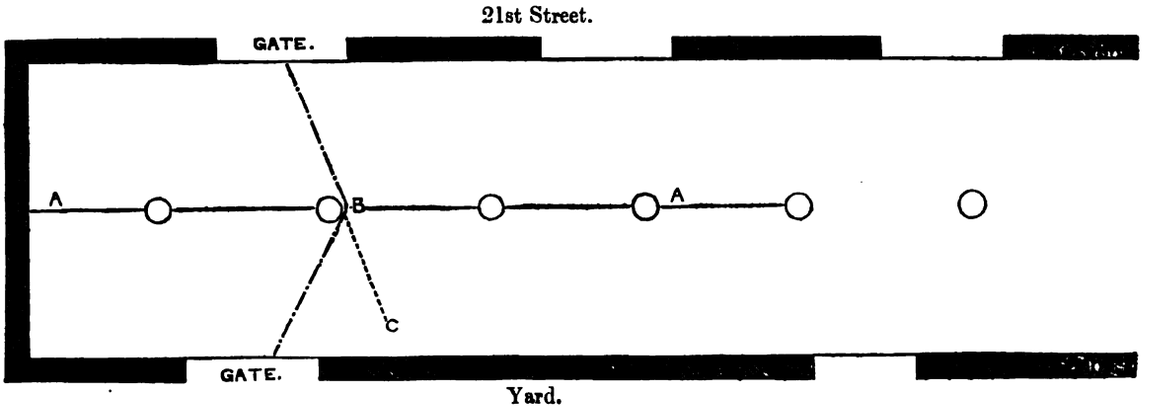
turn the coal over, and the fire was found in one of the spruce uprights which supported the trestlework of the track from which the coal was dumped. This coal had been piled about seven months, and the fire was directly under the track from which the coal was dumped. The fire was confined to a space about 8 inches in diameter, and had not, so far as could be discovered, affected the coal except by disintegration. It will be noticed in this case that the heat was sufficient to ignite the wood, and had it not been discovered, the burning of the wood would have ignited the coal. The high temperature that had been noticed in this pile of coal previous to the discovery of the fire was 120°; and while the coal was being removed, another thermometer, within 10 feet of the one indicating 200°, only indicated 118°.

TABLE of TEMPERATURES of DOMESTIC COALS (Penn and Westmoreland), NEWBURGH PROVINCE (Nova Scotia) and NEWCASTLE, G.B.

Date.	Domestic Coals.	Atmosphere.	Date.	Domestic Coals.	Atmosphere.	Newburgh, outside.	Date.	Domestic Coals.	Atmosphere.	Province, outside.	Date.	Domestic Coals.	Atmosphere.	Date.	Domestic Coals.	Newcastle.	Atmosphere.	Date.	Domestic Coals.	Newcastle.	Atmosphere.
1873			1873				1873				1874			1874				1874			
July 3	84	84	Aug. 1	95	78		Sept. 1	101	74		Jan. 2	76	42	Nov. 5	74	122	45	Dec. 1	69	112	23
„ 5	85	78	„ 2	93	79		„ 2	98	70		„ 3	76	38	„ 6	90	126	51	„ 2	69	114	32
„ 7	87	68	„ 4	95	74		„ 3	98	73		„ 4	76	50	„ 7	93	129	49	„ 3	69	113	42
„ 8	87	70	„ 5	93	70		„ 4	98	75		„ 5	76	44	„ 12	91	126	38	„ 4	69	112	42
„ 9	89	72	„ 6	92	74		„ 5	98	78	148	„ 6	76	35	„ 13	91	121	31	„ 5	69	112	27
„ 10	90	75	„ 7	91	74		„ 6	98	68	148	„ 7	76	55	„ 14	91	121	25	„ 6	69	111	35
„ 11	89	68	„ 8	92	76		„ 8	100	60	148	„ 8	76	52	„ 16	92	116	38	„ 7	68	120	40
„ 12	89	68	„ 9	91	75		„ 9	100	64	148	„ 9	76	32	„ 17	88	115	44	„ 8	68	110	39
„ 14	93	76	„ 11	93	70		„ 10	99	60	146	„ 10	76	38	„ 18	87	116	54	„ 9	68	110	29
„ 15	93	78	„ 12	93	72		„ 11	99	60	148	„ 11	76	35	„ 19	86	118	34	„ 10	66	108	37
„ 16	93	76	„ 13	93	65		„ 12	99	64	148	„ 12	74	30	„ 20	87	119	38	„ 11	67	107	36
„ 17	93	74	„ 14	95	64		„ 13	99	65	148	„ 13	64	26	„ 21	84	116	42	„ 12	67	108	30
„ 18	93	70	„ 15	95	65	114	„ 14	98	48	148	„ 14	66	30	„ 23	84	114	43	„ 14	63	112	44
„ 19	93	65	„ 16	95	72	114	„ 15	98	48	144	„ 15	66	22	„ 24	85	117	53	„ 15	66	112	15
„ 21	93	68	„ 18	95	66	114	„ 16	98	60	140	„ 16	64	15	„ 25	84	115	40	„ 16	66	107	17
„ 22	92	72	„ 19	95	70	112	„ 18	98	55	140	„ 17	64	18	„ 26	84	115	27	„ 17	64	105	36
„ 23	92	74	„ 20	95	70		„ 19	98	60	140				„ 27	81	114	29	„ 18	65	105	26
„ 24	93	78	„ 21	95	70		„ 20	98	62	140				„ 28	73	114	38	„ 19	64	106	34
„ 25	93	82	„ 22	95	75		„ 22	98	52	138				„ 29	70	112	35	„ 21	63	107	26
„ 26	93	82	„ 23	95	77		„ 23	98	55	132				„ 30	69	114	25	„ 22	62	105	26
„ 28	93	78	„ 25	93	60	124	„ 24	98	60	132								„ 23	60	109	28
„ 29	93	78	„ 26	101	68		„ 25	98	64	132								„ 24	60	107	35
„ 30	93	78	„ 27	102	68		„ 26	98	64	132											
„ 31	93	78	„ 28	102	65		„ 27	98	64	132											
			„ 29	101	66		„ 28	98	68	132											
			„ 30	102	65	88	„ 29	98	70	132											
							„ 30	98	60	132											

II.

A STATEMENT made by MR. LEES, President of the New York Gas Company.



STATEMENT from New York Gas Company.

A A is a wooden partition to separate coal.

Over B is an open ventilator in the roof through which the smoke was first seen. The gates in the yard and on 21st Street were opened and the coal removed to B (see red dots), where the partition was found charred and burning at about 15 or 20 feet from the ground. The fire was then traced from B to C (see black dots), growing deeper all the way, until at C it was found in the form of a red-hot coke on the floor. There was no wood at or near C. Nor was any burned except on the partition at B. The floor is of stone.

The whole quantity of coal burned did not exceed (say) 30 tons, of which the centre, C, was thoroughly carbonized.

The coal was Penn and Westmoreland mixed and had been in about six months.

III.

On the SPONTANEOUS COMBUSTION of CHARCOAL, by the HON. KNOWLTON S. CHAFFEE, of Boston.

In answer to your questions on the spontaneous combustion of charcoal I will say, First, that I have been engaged in the business about 30 years, and have annually handled nearly a million of bushels. Second, the coal is made at all seasons of the year, and chiefly burned in brick-kilns. Third, the Boston market requires that the coal shall be free from dust, therefore it is screened over half-inch mesh screens. The screenings if dry and piled in heaps of 100 bushels or more, whether on the ground or a floor of any kind, either under cover or outside, will heat and produce spontaneous combustion in a very few days. The heat

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will extend through the whole pile. You ask, whether wet or dry? Of course if very wet it cannot heat, and if perfectly dry it would not as long as it remained so, but it will inhale moisture enough from the ground and atmosphere to produce heat; and if in a large pile, it will bear several heavy showers before it would become wet enough to prevent heat, as the water would not penetrate sufficiently through it. There is no danger of regular charcoal heating, as its size will admit the circulation of air. If pulverized to a fine powder it will be so solid that it cannot heat, but the screenings to which I refer, when dry, will heat under almost any circumstances.

Coal burned in pits the old-fashioned way, covered with earth, never troubled us, and I do not believe will heat.

IV.

STATEMENT of ESTES HOWE, ESQ., M.D., President of the Cambridge Gas Company.

* * * * In November 1873 a spontaneous fire occurred in the coal shed of the Cambridge Gaslight Company, Massachusetts. The shed is of wood, 300 feet long, 70 feet wide, situated on a wharf, and receives the coal directly from the vessel. The coal is hoisted to the height of the run which extends the whole length of the building through the middle, at a height of 22 feet. The floor at this time was of earth. The coal affected was a mixture of Glace Bay and Caledonia, Nova Scotia coals. The run is supported by posts of spruce 10 inches square and 10 feet apart each way. The coal had been put in rapidly and was all dumped from the run. It was thought to be finer than usual, and probably more damp. There was some idea that rain had blown in through the hatchways and dripped down at the place affected. This is not certain. The fire was first indicated by steam and smoke escaping. Thinking the trouble might be superficial, men were put on to shovel the coal over, but at one point, at which one of the posts was the centre, it was found that the heat increased on going down. At a point about five feet from the surface the post was completely converted into charcoal, and that without any appearance of redness, no live fire being found for two or three feet below this point. The coal surrounding the post was agglutinated, and in the first stage of coking. The fire was followed down to the floor, and a very large quantity of coal was removed. At a point about 20 feet distant, around another post, the same heating, though to a less degree, occurred. Some heating in the upper part of the coal heap at a point nearly 200 feet distant was also observed, but shovelling over about four or five feet of the top put an end to it. A similar difficulty occurred in a pile of Cape Breton coal in August of this year. It was early discovered, and was confined to a limited space directly *under the dump*. The coal was fine and closely packed, and possibly unusually damp. There was no post or other wood concerned in this case. Nor was there any tendency to heat shown in the rest of the coal. For many years I have noticed my coal piles showed a tendency to heat, and I have had to remove coal which otherwise I feared would ignite.

I have visited the Brooklyn, New York, and Manhattan gas works, and have made inquiries of many in relation to the matter of spontaneous combustion. I find that it has taken place in charcoal, albertite, Newcastle coal, all Cape Breton coals, and all trans-Allegheny coals, that is, in Penn, Westmoreland, Youghiogheny, Newburgh, Orrel, Fairmount, &c. The first three are taken from the Pittsburgh main seam at different points, and they are the purest and best American gas coals. In every case, except one at the Manhattan, the coal affected was fine and very closely packed. In many, but not in all cases, the trouble seemed to originate where the coal was dumped.

My own observations have led me to think that a certain process of heating in piles of coal is very general, if not universal. The observations of Mr. Armington, by means of gas pipes driven down through or placed in the coal as it is stored, confirms this idea, and the engineer of the Manhattan gasworks makes the same statement. Mr. Armington has in his coal shed, which is 210 by 180 feet, and now stored 22 feet deep with coal, mostly American, 60 of these tubes, with thermometers in them, of which a daily register is kept, As having a bearing on this matter I give you some figures from his register. The tubes are numbered. A group of tubes quite near each other, numbered 1, 2, 3, 4, were placed at a point which seemed hot, which was filled 14 feet deep, and the filling discontinued on account of the heat.

PENN COAL.

1875.

No.	Oct. 13.	Oct. 14.	Oct. 22.	Nov. 13.	Nov. 30.
	°	°	°	°	°
1 - -	116	116	98	90	84
2 - -	120	126	120	100	92
3 - -	116	118	104	98	80
4 - -	74	76	76	80	68

FAIRMOUNT COAL.

	118	118	112	56	56
	106	106	102	62	58
	102	102	100	70	56
	98	98	90	52	62
	90	88	92	54	64
	86	84	84	56	70

I would add that the labourers in the coal sheds all agree that the coal heaps go through a heating process, and when that is once over they think it does not recur.

There is a very general impression that the presence of wood leads to spontaneous combustion. It seems to me that this impression arises from the fact that wood, especially all varieties of fir, ignites at a much lower temperature than coal, and if coal is heated in the presence of wood, the wood first takes fire.

I may add that my experience shows that if air is excluded the process of combustion in the compact heap of coal is slow, and time may be taken. I have yet to hear of a case where there was a general heating to the blazing point of a pile of coal. There seems to be a nucleus of heated coal, which gradually extends upwards, spreading as it rises. When, however, any considerable quantity is heated, gas is given off, which coming to the air may be lighted and burn rapidly.

It seems to me that the plan of observations of temperature by means of gas tubes in the coal is easily applicable to coal on board ship, and would afford most valuable information of the condition of the cargo.

V.

STATEMENT of ROBERT C. ADAMS, ESQ., of Montreal.

The Nova Scotia coals imported in 1873 by the Grand Trunk Railway were piled in open spaces in three localities. One pile, all of Cape Breton coal, of 12,000 to 15,000 tons, another of 12,000 tons, chiefly of Cape Breton, and the third chiefly of Nova Scotia (Pictou) with some Cape Breton. Much of the coal was wet when piled, for the season was rainy. Late in the fall, when the coal had been two or three months in yard, the two piles consisting of Cape Breton coal were discovered to be on fire, and the third smoked. The coal was dug through, turned over, and the fire extinguished by this means. Water was also used freely, but without much effect. The coal was very fine. The third heap did not ignite.

The gas company last winter had about 9,000 tons of Cape Breton coal stored quite dry in a covered building, piled 12 to 14 feet high. The coal was small. After being stored five or six months fire broke out among the larger sized coal that ran out to the walls, and against the posts supporting the roof. The fire ran up the posts, ignited the roof and the platforms over the coal. This caused the whole surface of the coal to catch fire, and it burned to a depth of 2 feet, being finally extinguished by water. The fire below was subdued by digging through and carting away the coal. It was found that among the small coal in the centre of the pile there was no fire. This causes the engineer to think that ventilation assists combustion, the fire having burned in the large coal where there was the most circulation of air. The Grand Trunk Railway adopting the opposite theory, have placed ventilating platforms and chimneys through their coal heaps.

An illustration of the danger arising from wet coal is furnished by a vessel lately arrived with Cape Breton coal. She loaded in the rain, and the wet coal under the hatches was nearly in a state of combustion, while the drier coal in the ends of the vessel was cool.

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VI.

Office of the Boston Gas-Light Company,
No. 24, West Street, Boston,

DEAR SIR, 30th Nov. 1875.

WE have been purchasers of Albert coal for more than twenty years, and during the larger proportion of that time have received a very considerable share of the products of the mine.

The published analysis of the coal shows an entire freedom from sulphur.

It has usually been stored by us in large sheds, and piled to a height of twenty or more feet. Latterly, it has been piled in the open air, without any protection from the weather.

During the period of time that we have had the coal, it has heated four times—but more seriously during the autumn of 1874 than ever before. On two seasons before this, it heated and fired the timber supports of the shed in which it was stored, for which no explanation at the time could be found.

Last year a special examination of the coal was made for the purpose of ascertaining the cause. It was found that a certain portion of the lining of the mine, as well as the seam in the coal, contained pyrites. Thin shale formed about five per cent. of the mass, and with the disintegrated condition of the coal, being mostly of the description called "slack" at the mines, sufficient elements were found to account for heating, fusion, or even fire.

The following analysis, Dr. S. Dana Hayes and Prof. P. Sterry Hunt shows the effect of "heating":—

	Albert coal of good quality.	Albert coal after "heating."
Bituminous and volatile matter -	56·05	4·65
Coke - - - - -	40·81	85·89
Ash (red and mostly oxide of iron)	3·14	9·46
	100·	100·

Whenever the coal showed symptoms of heating, it was shovelled over in the heaps for the purpose of cooling it.

Yours respectfully,
W. W. GREENOUGH.

Henry S. Poole, Esq.,
Inspector of Mines,
Halifax, Nova Scotia.

(*d.*) PAPER and STATISTICS from the ROYAL MAIL STEAM PACKET COMPANY.

THE following information and statistics were furnished by the Royal Mail Steam Packet Company with reference to the Inquiry of the Commission.

Royal Mail Steam Packet Company,
No. 55, Moorgate Street, London, E.C.

SIR, 16th November 1875.

I AM instructed by Mr. Marshall to forward you the following documents which you wished to be furnished with for the information of the Royal Commission on the Spontaneous Combustion of Coals, viz., Copy of instructions to superintendents at ports of shipment; Table showing the description, quantities, destination, &c., of the various shipments for the Company during the last three years; and I will be glad to furnish you with any further information you may wish for the information of the Committee.

I am, sir, your obedient servant,
T. C. W. DYER,
pro Secretary.

James Carmichael, Esq.,
32, Abingdon Street,
Westminster.

Royal Mail Steam Packet Company.

Instructions for Mr. Pope, Coal Inspector.

1. By accompanying form, marked No. 1, you will observe that all coals purchased by the Company should be of the best quality, and fresh wrought; and it will be your duty to see that the coals shipped are the produce of the mines and of the description stipulated for. Moreover, that all conditions of purchase are duly fulfilled. In order that you may have the necessary power to ascertain this, you have permission to examine the pit-head tally books at all times, and you will be duly advised of all new contracts.

2. The loading of each essel must be personally superintended during the shipment.

3. Each vessel must be examined before receiving stiffening to see that the hold is properly prepared and cleaned to receive it, and that the coals are kept strictly clear of the ballast, which, if of sand, is injurious to them.

4. The vessel to be again examined when totally unballasted to ensure the hold being clean throughout.

5. The weight of the coals at the tips to be carefully superintended and checked, and subsequently compared with the colliery weights, the result to be reported on Form No. 2, and it is important that the weighing machines at the tips should be tested as to their correctness as often as opportunity arises.

6. In cases where the coals have to be screened at time of shipment, it must be seen that this is properly done, the screens kept open and in no way choked up with the small. The small coal to be drawn, weighed, and properly allowed for.

7. A check must be kept of the tares on the coal waggons, as differences have been frequently found to exist between the weights painted on them and the actual tares. Care must be taken that this is not done in dry weather, and you can exercise your own discretion as to the mode and time of doing this. You will find a memo. marked No. 3, showing how the weights are recorded and the averages arrived at in cases of this kind.

8. The Alexandra Docks at Newport being fitted up with tips and weighing machines, it is preferable that the ships chartered by the Company should load there, and if possible under those tips having anti-breakage boxes. You will see that the latter are always used at first to convey the coal easily into the hold, and, in conjunction with this, that the staith is lowered sufficiently, or as much as possible into the hold, and so prevent much breakage.

9. Although the Company undertake to load the vessels chartered by them in a certain number of days, it must be understood that the contractors hold them harmless in this respect (see Form No. 4), and in case of any question of this kind arising the captains must be referred to the contractors for a settlement, but the facts are nevertheless to be fully reported to the secretary.

10. When a ship is chartered, copy of the charter-party will be at once sent you, and no coals are to be shipped (except those required for stiffening) until the ship be wholly unballasted and ready for cargo, when the loading days may be said to commence, supposing the ordinary notice for cargo has been given to the contractors.

11. You will carefully ascertain what coals the vessel has on board (if any) previous to cargo being shipped. This should be kept apart, and made up to one per cent. of cargo. Should the captain have any wood on board it can stand against a proportionate quantity of coal, if you think it advisable.

12. Bills of lading are issued on the Company's form, No. 5, in sets of four; two of which are to be sent to the Company's office, one by the ship for the Company's agent, with the copy of charter-party, and the other for the captain. The captain must sign for the cargo on the bills of lading as per dock or railway weights.

13. The captain must sign (on the back of the bills of lading) for the advance which will be paid in London in terms of clause in charter-party. Great care is to be taken in calculating the freight, which is to be inserted on the bills of lading, deducting the advance if any. It is seldom more than one third of the freight is advanced, but in no case (unless with the Company's sanction) is the advance to exceed the amount stated in charter-party. The captains can, however, take what lesser amounts they choose, provided the same be not lower than 50*l.*, except in cases of very small ships.

14. A form of certificate, No. , is to be filled up for each vessel which may be loaded, and sent to the Company's office with the bills of lading. On the back of this certificate the colliery and tip weights are to be inserted, also the quantity of small extracted, which deduction from the tip weights would, in the case of double-screened coal, form the bill of lading quantity.

15. The contract for coals required at Southampton has been made with Messrs. D. Davis and Sons for their double-screened Merthyr coal. A steamer is sent by Messrs. Wm. Hill & Co. about once a week for these supplies, and the Company pay for the same in accordance with the *delivery* weight at Southampton. It is, however, necessary that in addition to the usual inspection you should ascertain the quantity shipped, and inform the Company's superintendent at Southampton (Captain Bevis) immediately a steamer is loaded of the quantity she has on board.

16. A daily report (No. 6) should be made to the Company stating the quantity of coals shipped during the day, vessels in port when stemmed for cargo, and all other information which you may consider the Company should be acquainted with. It would be interesting also if you stated any information you might glean about new

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pits being opened, alterations in wages, strikes, &c. of colliers.

17. Before the invoices for coals are sent to this office for payment they should be certified by you as correct.

18. You will send a note of your travelling expenses to the secretary monthly, as well as a note of your salary, a cheque for which will be sent to you.

19. A demand is to be forwarded to the secretary every three months for all stationery required, and the supplies will be sent from the Company's printers. Samples of same are to accompany your demand, but in case you should have to purchase any stationery, &c., a receipted invoice for the same is to accompany the monthly account.

20. The Company's agents at their coaling depôts are:—

Lisbon -	Messrs. R. Knowles & Co.
Cape de Verds	Messrs. Millers and Nephew.
Rio de Janeiro	Thomas Hollocombe, Esq.
St. Thomas -	J. B. Cameron, Esq., Superintendent.
Jamaica -	Captain Dix, Superintendent.
St. Lucia -	F. Peter, Esq.
Colon -	J. H. Leverick, Esq.
Havana -	J. V. Crawford, Esq., H.B.M. Consul.

STATEMENT showing the NAMES and QUANTITIES of the various Descriptions of COAL shipped by the ROYAL MAIL STEAM PACKET COMPANY during the Three Years from November 1872 to October 1875.

Name of Coal.	Tons shipped.	Destination.								
		Southampton.	Jamaica.	St. Thomas.	Havana.	St. Lucia.	Colon.	Rio.	C. Verds.	Lisbon.
Davis' Merthyr - -	97,395	12,355	23,211	8,331	6,686	7,584	1,524	20,326	12,228	5,146
Ricca Rock and Black Vein	85,847	47,362	12,500	2,957	3,447	878	1,627	6,559	5,564	4,953
Ocean Merthyr - -	15,632	—	2,582	3,697	442	1,302	632	3,911	—	3,066
Tredegar - - -	13,269	—	2,600	2,953	705	1,300	—	2,515	1,661	1,535
Powell's Duffryn - -	22,784	22,784	—	—	—	—	—	—	—	—
Ebbw Vale and Abercarn -	17,510	—	5,281	2,705	—	3,181	—	1,860	2,959	1,524
Wilkesbarre (American) -	7,588	—	3,159	3,125	706	598	—	—	—	—
Bryn Mally - - -	5,307	—	4,468	839	—	—	—	—	—	—
Westminster Brymbo -	16,248	—	4,632	6,166	1,699	—	—	3,247	504	—
Jonassohn's W. Hartley -	457	—	—	—	—	457	—	—	—	—
Russell's New Black Vein -	550	—	—	—	—	—	—	—	376	174
Fothergill's Aberdare -	3,900	—	418	1,261	300	—	—	—	519	1,402
Coed Talon - - -	2,215	—	896	—	—	505	—	—	814	—
Cyfartha - - -	2,012	—	968	500	—	—	—	—	544	—
Wyndham Merthyr - -	803	803	—	—	—	—	—	—	—	—
Hood's do. - -	35,284	20,776	1,299	2,397	599	1,370	—	6,101	2,742	—
Nantyglo and Blaina -	22,009	4,408	5,360	2,545	—	—	—	4,662	2,559	2,575
Grange Coal - -	1,343	—	552	791	—	—	—	—	—	—
Wear do. - -	335	335	—	—	—	—	—	—	—	—
Insolis Merthyr - -	779	—	—	779	—	—	—	—	—	—
Wills' Merthyr - -	587	—	—	—	587	—	—	—	—	—
Blaenavon - - -	157	—	—	—	—	—	—	—	—	157
Dinas Merthyr - -	17,001	816	5,845	4,135	1,203	—	—	3,499	1,503	—
Tylacoch - - -	817	817	—	—	—	—	—	—	—	—
Pumpquart Anthracite -	475	—	—	—	—	—	475	—	—	—
Maesteg Merthyr - -	1,330	—	—	—	—	—	—	—	742	588
Davison's W. Hartley -	378	—	—	—	—	—	—	—	—	378
Cowpen Hartley - -	477	—	—	—	—	—	—	—	—	477
Stewart's West do. - -	470	—	-	.	—	470	—	—	—	—
Ewloe Hall - - -	223	223	-	—	—	—	—	—	—	—
Bebside W. Hartley -	198	—	-	—	—	—	—	—	—	198
Londonderry Hartley -	2,181	836	1,095	—	—	250	—	—	—	—
Scotch (name unknown) -	456	456	—	—	—	—	—	—	—	—
Hartley Main - -	2,343	1,901	—	-	—	—	—	—	—	442
Bentinck W. Hartley -	470	470	—	—	—	—	—	—	—	—
Wrexham and Acton -	335	—	—	335	—	—	—	—	—	—

Number of vessels employed for foreign ports - - 454
Do. do. Southampton (estimated) - 138

The only known case of coals heating or taking fire on board or in stores took place at Cape de Verds in 1873 amongst a heap of Coed Talon and Bryn Mally coals.

(e.) PAPER and STATISTICS from the PENINSULAR and ORIENTAL STEAM NAVIGATION COMPANY.

The following information and statistics were furnished to the Commission, with reference to their Inquiry, by the Peninsular and Oriental Steam Navigation Company:—

MEMORANDUM relative to SPONTANEOUS COMBUSTION of COAL on SHORE, and in BUNKERS of the COMPANY'S STEAMERS.

Cases of spontaneous combustion in the Company's coal stacks have taken place, but taking into consideration the heavy stocks kept up, and the extremes of heat and moisture to which they are exposed, such instances are very rare.

About 10 years ago a case of firing occurred near the bottom of a large stack of coal at Calcutta, when about a thousand tons of coal had to be removed; it was then discovered that for a space of about six feet square the coal was in a very heated and charred condition.

At Aden, in July last, two cases of heating occurred, one in the heart of a stack of North Wales coal, and the other near the surface of a heap of Bebside Hartley (Newcastle) coal.

In the course of the last 10 years three or four cases of explosion in the bunkers of the Company's steamers have taken place owing to the *close* covers of the bunkers having been kept on too long; it is, however, one of the Company's standing orders to their chief engineers, that "the close "covers of the bunkers must only be put on when the "decks are being washed, or in very bad weather, *grated* "covers being used on all other occasions, so as to permit "of the escape of the gas generated in the coals."

(For the same reason it would be well were the hatches of colliers lifted on all occasions where practicable.)

In the Company's experience, cargoes of the South Wales coal are much less liable to spontaneous combustion than either Newcastle or North Wales coal.

The arrangements for stacking the Company's coal are as follows:—

Malta - -	In sheds in the open, and in barges ready for shipment.
Brindisi - -	In the open.
Aden - -	" "
Bombay - -	Under sheds.
Calcutta - -	" "
Galle - -	In sheds and in the open.
Singapore -	In sheds.
Hong Kong -	"
Shanghai -	"
Yokohama -	In floating hulk, and in sheds on shore.
King G. Sound -	In floating hulks, and in the open on shore.

P. & O. S. N. Company, London,
5th November 1875.

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STATEMENT showing the NUMBER of COLLIERS LOADED on COMPANY'S ACCOUNT, TONS SHIPPED, VESSELS LOST at SEA or BURNT, with the DESCRIPTION of COAL loaded.

1873–74.

Number of colliers loaded - - - - - - - - 436

TONS SHIPPED.

North Country - - - - - - - -	154,628
North Wales - - - - - - - -	117,747
South Wales - - - - - - - -	279,125
	551,500

VESSELS LOST AT SEA.

Sailed.	Ship.	Destination.	Description of Coal.
January 4th, 1873 -	"Oneiza" - - -	Aden - - -	Cowpen Hartley.
March 24th, 1874 - -	"Atlantic" - - -	,, - - -	Hancock's Brymbo.
October 14th, 1873 -	"Shalimar" - - -	Bombay - - -	West Hartley Main.
December 27th, 1873 -	"Broughty Castle" - -	,, - - -	,,
September 23rd, 1874 -	"Norah Graeme" - -	,, - - -	Battersby's N.W. Main.
August 27th, 1874 -	"Nellie" - - -	Brindisi - - -	Powell Duffryn.
March 5th, 1875 - -	"Nellie Hastings" - -	Singapore - -	Scott's Brymbo.

VESSELS BURNT AT SEA.

June 12th, 1874 - -	"Euxine" - - -	Aden - - -	Howard's W. Hartley.
,, 18th, 1874 - -	"Oliver Cromwell" - -	,, - - -	,,
July 2nd, 1874 - -	"Calcutta" - - -	,, - - -	,,
December 8th, 1873 -	"Mooresfoot" - - -	"Bombay" - -	,,

P. & O. S. N. Company,
July 6th, 1875.

A. M. BETHUNE,
Secretary, P. & O. S. N. Co.

STATEMENT showing QUANTITIES and DESCRIPTION of all COALS shipped by the Peninsular and Oriental Steam Navigation Company from Great Britain to the under-mentioned Ports from 1st January 1874 to 1st January 1875.

To	Colliers.	Description of Coals.	Tons.	Remarks.
Alexandria - - -	1	Bebside West Hartley - - -	1,363	
	2	West Hartley Main - - -	760	
	1	Davidson's West Hartley - -	586	
	3	Insole's Merthyr - - -	2,301	
	1	Jaynes' Tillery - - - -	543	
	1	Battersby's N. W. Main - - -	598	
Totals -	9		6,151	
Aden - - - -	2	Bebside West Hartley - - -	4,019	
	5	Howard's ,, - - -	8,917	3 burnt.
	1	Carr's ,, - - -	996	
	1	Bower's ,, - - -	1,155	
	8	Battersby's N. W. Main - - -	14,316	
	9	Scott's Brymbo - - -	14,937	1 lost.
	1	Laird's Welsh Hartley - - -	1,875	
	4	Powell Duffryn - - - -	5,992	
	4	Insole's Merthyr - - -	7,136	
	1	Davis' ,, - - -	1,412	
Totals -	36		60,755	
Brindisi - - - -	1	Davidson's West Hartley - - -	1,167	
	1	Carr's ,, - - -	1,194	
	1	Bebside ,, - - -	1,016	
	6	Buddles ,, - - -	6,474	
	18	Powell Duffryn - - - -	19,011	1 lost.
Totals -	27		28,862	
Bombay - - - -	1	Bedside West Hartley - - -	1,500	
	2	West Hartley Main - - -	2,069	100 tons destroyed by fire near Bombay.
	1	Buddles' West Hartley - - -	1,704	
	2	Howard's ,, - - -	3,729	
	7	Scott's Brymbo - - - -	10,782	1 lost and 1 missing.
	6	Battersby's N. W. Main - - -	11,416	
	1	Laird's Wesh Hartley - - -	1,775	
	2	Insole's Merthyr - - -	3,785	
	1	Powell Duffryn - - - -	637	
	1	Patent fuel - - - -	817	
Totals -	24		38,164	
Calcutta - - - -	1	Scott's Brymbo - - - -	1,100	
	1	Powell Duffryn - - - -	2,186	
	1	Davis Merthyr - - - -	1,704	
	1	Insole's ,, - - - -	1,804	
Totals -	4		6,794	

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To.	Colliers.	Description of Coals.	Tons.	Remarks.
Hong Kong	2	Bowers' West Hartley	3,278	
	2	Battersby's N. W. Main	3,261	
	2	Scott's Brymbo	3,146	
	2	Insole's Merthyr	3,061	
	2	Powell Duffryn	5,079	
	1	Hood's Merthyr	1,248	
Totals	11		19,073	
Malta	1	Londonderry Hartley	963	
	3	Buddles' West Hartley	2,383	
	2	Bebside ,,	1,865	
	2	Carr's ,,	2,460	
	1	West Hartley Main	1,940	
	1	Battersby's N. W. Main	1,875	
	32	Powell Duffryn	33,044	
	1	Insole's Merthyr	1,277	
	1	Davis' ,,	994	
	2	Davis' Maestag	2,927	
	1	Aberdeen Merthyr	1,204	
Totals	47		50,932	
King George's Sound	1	Davidson's West Hartley	1,605	
	3	Battersby's N. W. Main	5,895	
	2	Scott's Brymbo	3,846	
	2	Powell Duffryn	3,750	
Totals	8		15,096	
Point de Galle	2	Battersby's N. W. Main	1,373	
	5	Scott's Brymbo	6,005	
	1	Cowpen Hartley	702	
	4	Howard's West Hartley	4,243	
	3	West Hartley Main	3,657	
	10	Insolve's Merthyr	12,822	
Totals	25		28,802	
Shanghai	2	Powell Duffryn	2,996	
	1	Insole's Merthyr	1,140	
Totals	3		4,106	
Singapore	1	Davidson's West Hartley	1,245	
	1	West Hartley Main	1,640	
	1	Scott's Brymbo	1,775	
	9	Insole's Merthyr	12,837	
	1	Powell Duffryn	1,337	
Totals	13		18,834	
Suez	1	West Hartley Main	1,857	
	2	Powell Duffryn	2,860	
Totals	3		4,217	
Yokohama	2	Powell Duffryn	3,345	
	1	Insole's Merthyr	1,872	
Totals	3		5,217	

122, Leadenhall Street, London, E.C.
15th November, 1875.

A. M. Bethune,
Secretary, P. & O. S. N. Co.

Summary.

Ports.	No. of Collliers.	Tons.
Alexandria	9	6,151
Aden	36	60,755
Brindisi	27	28,862
Bombay	24	38,164
Calcutta	4	6,794
Hong Kong	11	19,073
Malta	47	50,932
King George's Sound	8	15,096
Point de Galle	25	28,802
Shanghai	3	4,106
Singapore	13	18,834
Suez	3	4,217
Yokohama	8	5,217
Totals	213	287,003

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(*f.*) Paper and Statistics from the Mersey Docks and Harbour Board.

Statement as to the Shipment of Coal at the Board's High Level Railway, Liverpool, and at the Board's Appliances, Birkenhead.

Dear Sir, Secretary's Office, Liverpool, May 15, 1876.

Referring to my letter of the 25th ultimo, the statistical information in relation to the shipment of coal at this port, which has been prepared on the suggestion of the Chairman of the Traffic Committee, is now complete, and I am instructed to hand you the enclosed returns, &c. containing the same, for the use of the Royal Commission.

I am, &c.

Edw. Gittins,
Secretary.

J. M. Carmichael, Esq.,
Secretary of the Commission on the Combustion of Coal at Sea,
32, Abingdon Street, London, S.W.

Summary of Information.

1. List of Vessels and Lighters loaded from January 1st, 1875, to December 31st, 1875.
2. Time loading.
3. Weight and carrying capacity of Waggons.
4. Appliances, capacity of.
5. Rules, Regulations, and Charges.

	Board's High Level Railway, Liverpool.	Board's Appliances, Birkenhead.
No. 1. List of Vessels and Lighters loaded.	Vessels. See Table A. Lighters. See Table C.	Vessels. See Table B. Lighters. See Table D.
No. 2. Time loading:		
(*a.*) Time required to take in each waggon of coal, say from the time the waggon is hooked to the crane until the coal is tipped down the hatch.	Two minutes	Three minutes.
(*b.*) Quantity per hour that can be loaded into one ship, per crane or hoist.	100 tons per hour per crane, at the quickest speed.	180 tons per hour per hoist is the maximum quantity.
(*c.*) The largest quantity of coal shipped into one vessel per day.	600 tons in one day of 8 working hours.	608 tons, maximum quantity shipped at one hoist in one day of 12 working hours.
No. 3. Waggons:	Tons. cwts.	Tons.
Weight of the largest waggon that can be discharged by the appliances.	12 tons gross— Weight of waggon about 4 5 Weight of coal - 7 15 12 0	15 tons gross. Weight of waggons - - 5 Weight of coal - - 10 15
No. 4. Appliances:		
Capacity of appliances to ship per day of 12 working hours, if fully supplied with coal and ships.	2,200 tons per day	The maximum work done at the coal appliances has been given above (see No. 2), but the speed of tipping being dependent upon the trimming, and taking into consideration the class of vessels that load here, 350 tons of coal per day of 12 hours is a fair average work for each hydraulic tip, which will give a daily shipment by the three tips of 1,050 tons, equal to 326,550 tons per annum. The five hand tips are capable of loading 2,500 tons of coal per day of 12 hours, equal to 777,500 tons per annum.
No. 5. Rules, Regulations, and Charges:		
(*a.*) Rules and Regulations, and Charges.	Copies herewith. See Printed documents marked E. and F.	—
(*b.*) Regulations - -	- - - - -	See printed document marked G.
(*c.*) Charges - -	- - - - -	See written statement marked H.

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TABLE A.

LIST of VESSELS loaded with COAL, &c. at the Board's High Level Railway, Liverpool, from the 1st January 1875 to the 31st December 1875.

Ship.	Register Tonnage.	Draft.		Coal.	Cannel.	Coke.	Port of Destination.
		Feet.	Inches.				
Maria Casabona	700	19	6	987	—	—	Genoa.
Peerless	860	20	0	1,230	—	—	Calao.
Cheechino	634	19	0	890	—	—	Genoa.
Roberto	422	16	0	550	—	—	Havana.
Lenore	1,236	18	6	776	—	—	Callao.
Jason	490	16	6	722	—	—	Valparaiso.
Esmeraldo	280	15	0	365	—	—	Havana.
Hero	658	19	6	865	—	—	Mantanzas.
Pontiac	698	17	0	844	—	—	Valparaiso.
Tre Lorelle	446	16	6	814	—	—	Genoa.
Laurel McLennan	796	19	0	1,130	—	—	Valparaiso.
Caroline Sainty	219	13	0	327	—	—	Jersey.
Andrea Papa	592	18	6	923	—	—	Genoa.
Dartmouth	873	20	0	1,305	—	—	Valparaiso.
St. Mark	1,870	23	3	400	—	1,092	Coquimbo.
Sir Jno. Laurence	1,090	20	6	1,206	—	—	Valparaiso.
Franceschina	496	19	6	764	—	—	Genoa.
Kerelaw	316	16	0	444	—	—	Monte Video.
Havelock	454	17	0	606	—	—	Havana.
Asteria	210	13	0	345	—	—	Orico.
Carl Gustaff	673	19	0	951	—	—	Havana.
Eleanor Wheatley	111	12	0	116	—	—	Lisbon.
Themis	290	13	0	257	—	—	Demerara.
Croydon	375	16	6	542	—	—	Valparaiso.
Friuso	430	17	6	620	—	—	Havana.
Alfred	232	13	0	350	—	—	Lisbon.
Geo. Skolfield	1,320	20	7	1,372	—	—	Valparaiso.
Dryad	265	15	0	301	—	—	Gibraltar.
Dario	449	16	0	736	—	—	Genoa.
Eurique	582	—	—	659	—	—	Havana.
Emogene	481	—	—	723	—	—	Rio de Janeiro.
Lammerstragen	845	—	—	635	—	—	Hamburgh.
Golden Sheaf	454	14	6	525	—	—	Havana.
Cameos	446	—	—	440	—	—	Oporto.
Jane	636	—	—	917	—	—	Valparaiso.
St. Lucien	276	14	0	333	—	—	Cuba.
Ferdemde Lesseps	387	17	6	501	—	—	Bordeaux.
H. D. Brookman	687	—	—	751	—	—	Havana.
J. E. Brett	531	17	6	672	—	—	Havana.
Manilla	473	17	0	774	—	—	Genoa.
Agincourt	446	—	—	553	—	—	Mauritius.
Jessie Goodwin	327	15	0	454	—	—	Havana.
Angela	673	—	—	898	—	—	Genoa.
Yennia	315	12	4	203	—	—	Demerara.
Montemuza	208	14	6	248	—	—	Bordeaux.
Harry Baily	713	18	3	973	—	—	Havana.
Oracle	1,133	20	8	1,219	—	49	Valparaiso.
Maori	701	20	0	882	—	—	Madras.
Patua	321	—	—	452	—	—	Demerara.
Thomas Woods	520	—	—	689	—	—	Valparaiso.
Kennelworth	694	—	—	910	—	—	West Coast.
Hjemnet	383	—	—	480	—	—	Constantinople.
Vibilia	553	—	—	602	—	—	Cienfugos.
Maria	678	19	0	918	—	—	Genoa.
Lima	892	19	0	1,118	—	—	Valparaiso.
Rio Grande	326	16	0	467	—	—	Cuba.
Don Quixote	425	14	0	432	—	—	Havana.
Quebec	1,454	22	6	1,850	—	—	Valparaiso.
Constantia	560	17	0	581	—	—	Pisagua.
Eudymion	1,298	20	4	319	—	815	Coquimbo.
Helen Marion	693	19	0	—	520	—	Valparaiso.
Queen of Commerce	277	17	0	420	—	—	Havana.
Wimbledon	1,494	—	—	396	—	—	Quebec.
O. D. Witherell	631	15	9	773	—	—	Mantanzas.
W. H. Thomdike	677	15	3	732	—	—	Havana.
Maria Adal	168	—	—	211	—	—	Bordeaux.
Ricardo	148	13	0	175	—	—	Gibraltar.
Chieftain	670	13	0	295	—	—	Quebec.
Voyager	1,356	18	5	1,202	—	—	New York.
Springwood	989	20	10	1,322	—	—	Valparaiso.
Emily	351	13	0	349	—	—	Mantanzas.
Aurelie	548	16	0	693	—	—	Barbadoes.
Antoinette	1,118	19	7	217	—	736	Coquimbo.
Ville de Dieppe	240	16	0	336	—	—	Barbadoes.
Angelo Antonio	595	18	6	864	—	—	Calao.
Simla	1,110	18	3	—	997	—	New York.
Deux Sophie	212	15	0	319	—	—	Bordeaux.
Alexandra	268	14	3	385	—	—	Cardenas.
Ludwig	313	14	0	160	—	—	Antwerp.
Alice Emma	200	13	0	234	—	—	Bordeaux.
Eugene Maria	524	16	9	570	—	—	Bordeaux.
Madre Cerrute	631	19	0	793	—	—	Bordeaux.
Nova Goa	600	19	0	786	—	—	Lisbon.

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Ship.	Register Tonnage.	Draft.		Coal.	Cannel.	Coke.	Port of Destination.
		Feet.	Inches.				
Stanhope	770	20	0	1,113	—	—	Calao.
Try Again	153	13	0	221	—	—	Seville.
W. L. Bradley	432	15	0	553	—	—	Mantanzas.
Maori	700	20	2	848	—	—	Madras.
Ricardo	358	16	6	572	—	—	Constantinople.
Trevere	426	18	0	663	—	—	Constantinople.
Wooloomooloo	627	18	0	840	—	—	Cronstadt.
Golden Fleece	1,474	18	6	—	914	—	New York.
Wonder	165	13	0	258	—	—	Oporto.
Aristide	408	16	6	641	—	—	Madras.
Brodrene	673	15	0	271	—	—	Meranichi.
Arfacsad	610	19	0	873	—	—	Constantinople.
Francois Marie	113	12	0	193	—	—	Bordeaux.
Victoria Nancy	111	12	0	174	—	—	Brest.
Cecilia	611	14	0	488	—	—	Valparaiso.
Lothair	860	19	6	1,028	—	—	Valparaiso.
Oueota	1,031	21	7	1,528	—	—	Cape of Good Hope.
Frankfort Hall	727	17	0	491	—	—	Valparaiso.
Conte Serra	300	17	0	423	—	—	Gibraltar.
Birmingham	1,400	18	0	1,226	—	—	Quebec.
Sophie and Emily	98	12	0	165	—	—	Aviro.
Star	1,214	19	6	—	—	796	Coquimbo.
Rona	633	17	0	754	—	—	Anjer.
Memory	255	14	0	286	—	—	Cuba.
Triton	539	19	0	777	—	—	Constantinople.
Compadre	799	17	6	1,061	—	—	Valparaiso.
Erwood	187	13	0	305	—	—	Trieste.
Augusta	200	14	0	341	—	—	Constantinople.
Simari	599	17	0	803	—	—	Valparaiso.
West Derby	820	19	6	943	—	—	Ascension.
Jno. Ritson	513	17	1	674	—	—	Valparaiso.
Grimalda	540	19	0	801	—	—	Calao.
Peckforton Castle	1,088	21	7	1,170	—	—	Valparaiso.
Clevedon	697	17	7	890	—	—	Valparaiso.
Siberia	1,271	15	0	655	—	—	Quebec.
Hedwidge	898	19	0	1,026	—	—	Callao.
Wellington	393	17	0	627	—	—	Alexandria.
Celeste	597	17	0	853	—	—	Madras.
Camelo	200	16	0	306	—	—	Constantinople.
Vanguard	687	18	3	676	—	—	Valparaiso.
Castlehead	825	18	0	1,156	—	—	Valparaiso.
Biagguio	496	19	0	794	—	—	Genoa.
Antigua	287	16	0	368	—	—	Demerara.
Japan	394	17	0	559	—	—	Valparaiso.
W. H. Harkiss	482	16	0	594	—	—	Valparaiso.
Lady Franklin	364	16	6	608	—	—	Alexandria.
Naomi	126	12	0	208	—	—	Restronguet.
Elizabeth Taylor	261	14	0	374	—	—	Havana.
Sophie Helena	536	16	4	679	—	—	Valparaiso.
Aveure	420	17	0	635	—	—	Genoa.
Archencairn	287	15	0	439	—	—	Constantinople.
Northumbria	599	16	0	825	—	—	Valparaiso.
Camana	592	16	6	676	—	—	Valparaiso.
Arrogant	360	13	0	433	—	—	Bordeaux.
Peppo	397	16	0	580	—	—	Varna.
Globe	736	18	0	836	—	—	Valparaiso.
Romola	88	12	0	—	152	—	St. Petersburgh.
J. S. Barker	1,059	21	7	1,554	—	—	Madras.
Herrington	288	16	0	449	—	—	Malta.
Onyx	81	—	—	137	—	—	Bordeaux.
Album	490	18	0	732	—	—	Genoa.
Spectre	149	11	0	—	228	—	St. Petersburgh.
Maria Joseph	87	11	0	131	—	—	Bayonne.
Gio Bonos	618	18	0	978	—	—	Genoa.
Ursule	94	11	0	147	—	—	Bayonne.
Bossuet	650	18	0	732	—	—	Bordeaux.
Times	631	17	3	756	—	—	Valparaiso.
Bootle	248	13	0	433	—	—	Messina.
Margaret Hain	169	14	0	299	—	—	Smyrna.
Zercon	177	13	0	295	—	—	Malta.
Peppino	270	16	0	424	—	—	Malta.
Amore	560	17	6	779	—	—	Genoa.
Bruckburn Priory	431	17	0	587	—	—	Iquique.
F. W. Carlow	531	18	2	737	—	—	Rio Janeiro.
Matterhorn	1,327	19	6	—	—	618	Coquimbo.
Grace	93	12	0	—	142	—	Newfoundland.
Stranger	348	15	0	604	—	—	Varna.
Laurel	336	16	6	197	—	—	Poti.
Assyrian	294	15	0	493	—	—	Pernambuco.
Revival	136	12	0	230	—	—	Smyrna.
Fanny	431	19	0	625	—	—	Varna.
Callesto	536	16	0	691	—	—	Valparaiso.
Ben More	536	15	3	517	—	—	Valparaiso.
Carrie	240	13	0	351	—	—	Rio Janeiro.
Amy	167	13	0	301	—	—	Malta.
Nuova Speranza	438	16	0	651	—	—	Genoa.
Spirit of Morning	599	17	4	816	—	—	Valparaiso.
Nino Bixio	557	16	0	600	—	—	Rangoon.
Giuseppina P.	512	18	6	764	—	—	Genoa.
Albatross	314	13	0	456	—	—	Bahia.

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Ship.	Register Tonnage.	Draft.		Coal.	Cannel.	Coke.	Port of Destination.
		Feet.	Inches.				
Johan August	98	12	0	—	156	—	St. Petersburgh.
Cordova	521	15	11	719	—	—	Valparaiso.
Camelia	360	16	0	472	—	—	Naples.
Susie	320	14	4	456	—	—	Havana.
Cassowary	76	10	0	109	—	—	Colleraine.
San Rafael	955	20	10	1,162	—	—	Valparaiso.
Levanter	643	16	6	—	801	—	New York
Normanby	449	16	6	644	—	—	Rio Janeiro.
Clementine	360	14	0	584	—	—	Bordeaux.
Jessie Goodwin	337	15	0	487	—	—	Trinidad.
Emma	480	16	0	669	—	—	Genoa.
Bengale	368	14	0	375	—	—	Havre.
Elvina	210	13	0	248	—	—	Naples.
Bertha	357	15	0	576	—	—	Genoa.
Adriatic	436	15	0	592	—	—	Havana.
Etlie	499	17	10	704	—	—	Valparaiso.
Mio	570	18	0	928	—	—	Genoa.
Arch Fuller	700	17	3	749	—	—	Valparaiso.
Woodfield	995	18	9	1,009	—	—	Callao.
Arica	479	17	6	670	—	—	Valparaiso.
Annie Richmond	694	18	6	779	—	—	Valparaiso.
Ganymede	568	16	6	772	—	—	Valparaiso.
Koncordia	436	17	0	594	—	—	Cienfugos.
Sjufna	346	17	6	500	—	—	Demerara.
Levi Hart	407	16	10	354	151	—	Cardenas.
Magnet	464	18	0	605	—	—	Valparaiso.
Coldstream	545	13	0	197	—	—	Valparaiso.
Barracouta	610	18	0	760	—	—	Valparaiso.
Sibima	767	18	0	937	—	—	Valparaiso.
Baltic	554	18	0	906	—	—	Genoa.
Elsie Mary	186	14	0	304	—	—	Smyrna.
Alpha	349	17	0	494	—	—	Rio Janeiro.
Sir Robert Hudson	194	14	6	331	—	—	Messina.
Hannah	242	15	0	401	—	—	Rio Janeiro.
Crimea	501	18	0	717	—	—	Havana.
Acapulco	598	18	6	566	—	—	Valparaiso.
Intrepid	91	12	0	150	—	—	Bayonne.
Forest Belle	1,115	20	6	1,639	—	—	Havana.
Warwickshire	679	18	6	871	—	—	Valparaiso.
Huron	609	18	0	857	—	—	Valparaiso.
Jules Maria	282	15	0	337	—	—	Malaga.
Der Sud	482	16	0	628	—	—	Havana.
Celine	200	10	0	202	—	—	Quanpeert.
South Glen	598	18	0	814	—	—	Valparaiso.
Madre	742	17	0	945	—	—	Genoa.
Pacific	397	17	0	594	—	—	Valparaiso.
Maipu	593	17	0	818	—	—	Valparaiso.
Dorega	694	17	0	876	—	—	Valparaiso.
Prince Regent	457	15	10	589	—	—	Havana.
M. A. McFarlane	381	14	0	584	—	—	Genoa.
Eliza Moreton	437	16	0	544	—	—	Havana.
Maria Clotilda	486	17	0	712	—	—	Genoa.
Pasithea	587	17	0	638	—	—	Valparaiso.
Bonnie Dundee	1,026	20	6	1,324	—	—	Havana.
Adelina	558	18	0	653	—	—	Genoa.
Argyra	228	14	0	344	—	—	Smyrna.
Hamilton	326	16	0	280	—	—	Demerara.
Minnie Cameron	436	15	6	606	—	—	Havana.
Esther	484	15	0	587	—	—	Havana.
Carnarvon Castle	728	17	3	887	—	—	Valparaiso.
Tranmere	822	20	0	1,352	—	—	Rangoon.
D. Chapin	540	17	0	778	—	—	Havana.
Premeir	1,392	18	0	1,144	—	—	Rangoon.
Buckhorn	790	19	0	1,191	—	—	Simon's Bay.
William Fisher	299	15	0	459	—	—	Demerara.
Craigmullen	780	17	6	846	—	—	Valparaiso.
Norton Stover	334	15	0	548	—	—	Havana.
Loch Dee	699	17	10	829	—	—	Valparaiso.
Merweed	313	15	0	437	—	—	Demerara.
Bat Madre	781	17	0	1,084	—	—	Genoa.
Chasea	737	17	6	793	—	—	Valparaiso.
Cascatelle	346	14	0	449	—	—	Havana.
Minero	478	16	0	404	—	—	Valparaiso.
Town of Liverpool	286	16	0	344	—	—	St. Malo.
Prince Arthur	544	19	0	498	—	—	Caldera.
Akbar	332	16	0	586	—	—	Havana.
Colchagua	597	17	0	701	—	—	Valparaiso.
D. H. Tolke	445	14	0	629	—	—	Havana.
Ingomar	1,175	20	6	1,373	—	—	Rio Janeiro.
Louisa Malcolm	699	19	9	—	1,070	—	Rio Janeiro.
Gusto-del-Argento	331	15	0	392	—	—	Trieste.
M. A. Franklin	522	15	0	633	—	—	Havana.
Annina	115	12	0	206	—	—	Naples.
Pampero	588	19	0	683	—	—	Valparaiso.
Com Dupont	434	16	0	506	—	—	Havana.
Dundonald	991	19	6	607	—	—	Valparaiso.
Emmanuel R.	403	17	0	594	—	—	Genoa.
Antonio Ferraro	509	17	6	653	—	—	Genoa.

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TABLE B.

LIST of VESSELS LOADED with COAL, &c., at the BOARD'S APPLIANCES, BIRKENHEAD, from the 1st January 1875 to the 31st December 1875.

Ship.	Register Tonnage.	Draft.		Coal.	Cannel.	Port of Destination.
		Feet.	In.	Tons.		
S.S. Arbutus	236	13	0	17	418	Dublin.
Martha	268	14	6	358	—	Curacoa.
S.S. Santander	438	12	8	26	—	Bilboa.
Cassini	687	18	0	1,033	—	Brindisi.
Killarney	1,060	18	0	1,607	—	Bombay.
Sceptre	1,109	20	6	2,325	—	Bombay.
Susie	302	14	6	475	—	Demerara.
Vitesse	269	14	6	368	—	Odessa.
S.S. Alliance	198	12	6	8	363	Dublin.
Trent	1,410	15	3	572	—	Odessa.
Maude	495	10	0	79	—	Hull.
Lizzie Williams	827	18	3	893	—	San Francisco.
S.S. Alert	70	9	6	136	—	Newry.
Vidsjaaen	530	16	6	717	—	Callao.
S.S. Alliance	198	12	0	—	313	Dublin.
Lady Lycett	1,507	21	8	2,323	—	Bombay.
Ilion	544	18	10	802	—	Odessa.
G. W. Halls	456	16	6	646	—	Kingston.
Geerdma	123	11	0	191	—	Oporto.
S.S. Parsee	1,014	14	0	431	—	Bombay.
West	380	14	9	756	—	Oporto.
Malvino Schutt	372	15	6	502	—	Kingston.
S.S. Deva	151	12	0	16	293	Dublin.
Joven Adelaide	448	14	9	317	—	Oporto.
S.S. Emblehope	1,244	13	6	674	—	Bombay.
Potomac	1,504	21	6	2,323	—	Bombay.
Condar	199	14	0	194	—	Curacoa.
S.S. San Domingo	680	14	0	496	—	Pomaron.
Mary Watkinson	149	12	0	247	—	Dundalk.
S.S. Aston	89	10	0	170	—	Dublin.
City of Manchester	2,046	16	10	1,051	—	Calcutta.
Fordenskjold	1,118	23	6	1,240	—	Batavia.
Cato Annetta	158	10	6	172	—	Curacoa.
S.S. Harry S. Edwards	796	18	0	1,748	—	Malta.
Sheldrake	373	13	3	610	—	Dublin.
Emily Warbrick	152	12	0	287	—	Dundalk.
S.S. Alliance	198	12	6	8	300	Dublin.
Hermione	383	14	0	396	—	Bahia.
Braemar	838	17	3	1,007	—	Valparaiso.
S.S. Bywell Castle	891	15	0	425	—	Odessa.
Francesca	167	13	0	254	—	Gibraltar.
S.S. Newbiggin	875	11	0	285	—	Constantinople.
Emilien Marie	244	14	0	361	—	Rosario.
S.S. Alliance	198	12	6	9	355	Dublin.
Beltiste	412	14	6	504	—	Martinique.
Fannie	420	16	0	606	—	Martinique.
S.S. Capella	1,403	12	6	149	—	Malta.
Elizabeth	245	13	4	385	—	Martinique.
Alexandre Delphine	447	15	6	589	—	Martinique.
Cecil Brindley	94	10	0	172	—	Gibraltar.
S.S. Alliance	198	12	6	—	363	Dublin.
Elfin	279	16	5	423	—	Martinique.
Matchless	1,165	21	6	1,825	—	Callao.
S.S. Royal Minstrel	873	19	6	1,731	—	Brindisi.
Onyx	91	8	6	44	—	Glasgow.
Emelia	193	13	0	287	—	Seville.
Kilmarnock	303	12	6	425	—	Santander.
S.S. Alliance	198	12	0	—	363	Dublin.
Hindoo	2,504	17	2	453	—	Hull.
Pensacola	1,421	21	3	1,795	—	Callao.
Johanna	215	12	6	302	—	Rio Grande du Sol.
S.S. Alliance	198	12	0	6	370	Dublin.
Enmore	1,121	19	6	1,952	—	Brindisi.
Racer	61	9	10	109	—	Aveiro.
S.S. Alliance	198	12	6	10	371	Dublin.
Aphrodita	1,626	19	0	13	—	Calcutta.
S.S. Alliance	198	12	6	8	371	Dublin.
Serena	493	15	4	179 coke	—	Valparaiso.
S.S. Alliance	198	12	6	8	369	Dublin.
Ennerdale	797	19	0	1,303	—	Brindisi.
Wilhelmina Agatha	193	11	6	147	—	Curacoa.
Estrella de Chili	555	16	0	864	—	Singapore.
Navarino	2,965	17	6	423	—	Hull.
R. B. Fuller	1,360	23	3	1,014	—	San Francisco.
Mary Ellen	139	10	6	219	—	Oporto.
Wave	348	16	0	349	—	Cape Town.
S.S. Alliance	198	13	0	8	367	Dublin.
City of Glasgow	1,168	19	9	1,229	—	Calcutta.
Spirito	460	18	6	730	—	Odessa.
S.S. Cassini	687	17	10	470	—	Odessa.
Maresca	409	16	0	596	—	Odessa.
Keturah	140	9	0	108	—	Port Madoc.
King Arthur	1,047	17	6	699	—	Glasgow.
City of Benares	1,187	19	6	1,283	—	Calcutta.
S.S. Alliance	198	13	0	17	297	Dublin.
Ida	329	15	0	472	—	Monte Video.
Condor	199	12	0	260	—	Curacoa.

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Ship.	Register Tonnage.	Draft. Feet.	Draft. In.	Coal. Tons.	Cannel.	Port of Destination.
S.S. Hibernian	204	10	0	16	360	Dublin.
Ernesti Parodi	610	17	0	910	—	Callao.
Kingston	1,208	20	7	1,170	—	Bombay.
S.S. Hibernian	204	13	6	—	372	Dublin.
S.S. Hibernian	204	13	6	16	368	Dublin.
Hagarstown	1,903	16	0	796	—	Bombay.
S.S. Hibernian	204	12	0	—	372	Dublin.
Cato Annetto	158	10	6	203	—	Curacoa.
S.S. Hibernian	204	13	0	12	370	Dublin.
S.S. Hibernian	204	13	0	6	352	Dublin.
Est	953	19	6	1,159	—	Callao.
Uberty	52	10	0	44	—	Jersey.
F. Scalla	416	14	0	441	—	Bermuda.
Melmerby	1,510	11	0	132	—	Bombay.
Ferdinande	229	15	3	287	—	St. Jago de Cuba.
Laura	174	12	6	293	—	Madeira.
S.S. Hibernian	204	13	0	10	301	Dublin.
Isla	292	16	4	—	313	Para.
City of Madrid	1,191	19	1	1,257	—	Calcutta.
Ravenscraig	1,263	18	0	850	—	Montreal.
Udsire	444	16	7	355	—	Port-au-Prince.
Theresa	704	18	10	920	—	Rangoon.
Matador	685	20	11	194	—	Rio Janeiro.
Albion	184	12	6	325	—	Gibraltar.
S.S. Hibernian	204	13	0	16	386	Dublin.
S.S. Hibernian	204	13	0	14	348	Dublin.
Coloma	852	17	8	999	—	San Francisco.
S.S. Mino	450	16	0	117	—	Lisbon.
Lancashire Witch	368	14	6	509	—	Cape Town.
Bacchus	1,250	17	8	1,005	—	Akyab.
Estrella	554	18	0	763	—	Manilla.
Cordore	673	18	0	1,081	—	Rangoon.
Octave Marie	199	13	0	285	—	Gibraltar.
Blair Drummond	1,450	20	0	1,695	—	Calcutta.
St. Louis	487	15	0	603	—	Pernambuco.
M. C. Nelson	590	16	0	723	—	Caldera.
S.S. "Mauritania"	480	16	6	139	—	Valencia.
C. Maggio	419	16	0	556	—	Monte Video.
Cape Comorin	1,199	20	2	1,432	—	Bombay.
Venus	143	9	6	217	—	Oporto.
Savernake	1,284	18	6	1,303	—	Rangoon.

TABLE C.

RETURN showing the NUMBER of LIGHTERS LOADED MONTHLY with COAL, &c. at the BOARD'S HIGH LEVEL RAILWAY, LIVERPOOL, for the Year 1875.

1875. Month.	No. of Lighters.	Coal Loaded.	Cannel Loaded.	Coke Loaded.
		Tons.	Tons.	Tons.
January	107	10,620	51	—
February	97	9,452	—	—
March	117	11,719	84	50
April	111	11,314	—	121
May	78	7,427	—	—
June	91	8,226	54	—
July	91	8,422	—	—
August	98	8,964	400	—
September	109	10,171	219	—
October	141	14,167	—	—
November	126	12,160	—	—
December	115	11,928	217	—

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TABLE D.

RETURN showing the NUMBER of LIGHTERS LOADED MONTHLY with COAL at the BOARD'S APPLIANCES, BIRKENHEAD, for the Year 1875.

1875. Month.	No. of Lighters.	Tons.
January - -	384	47,747
February - -	331	42,889
March - - -	335	42,692
April - - -	359	45,681
May - - -	328	41,360
June - - -	365	46,695
July - - -	343	45,289
August - - -	363	48,805
September - -	358	49,556
October - - -	394	52,356
November - -	396	51,911
December - -	501	64,244

STATEMENT as to the QUANTITY of COAL SHIPPED by the BOARD'S APPLIANCES at LIVERPOOL and BIRKENHEAD, &c. for the Year ending the 31st of December 1875.

By the Board's Appliances, Liverpool, High Level Railway:—

	Tons.
By hydraulic cranes into ships and flats -	363,433
By hand tip into flats - - -	73,504
Total - - -	436,937

By the Board's Appliances, Birkenhead:—

	Tons.
By hydraulic tips into ships and steamers	77,479
By hand tips into flats and lighters -	579,175
Total - - -	656,654

NOTE.—The under-noted was shipped during the same period by other methods, viz.:—

	Tons.
By railway company's hand tip into flats and lighters - - - -	174,402
By licensed stevedores by barrow into sailing vessels - - - -	254,756
Total - - -	429,158

COAL TRADE STATISTICS.

Years.	Shipped at Birkenhead.	Shipped at High Level, Liverpool.	Total Birkenhead and Liverpool.	Board's Machinery.	Railway Coal Tips.	Shipped by Hand.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1862	268,000	51,000	319,000	11,906	60,000	196,000
1863	342,000	71,000	413,000	46,000	93,000	208,000
1864	441,000	131,000	572,000	70,000	115,000	256,000
1865	395,000	181,000	576,000	51,000	186,000	208,000
1866	558,000	262,000	820,000	161,000	15,000	247,000
1867	798,000	306,000	1,104,000	372,000	158,000	267,000
1868	817,000	188,000	1,005,000	367,000	181,000	268,000
1869	674,000	282,000	956,000	300,000	180,000	194,000
1870	602,000	326,000	928,000	248,000	176,000	177,000
1871	822,000	386,000	1,208,000	382,000	192,000	247,000
1872	946,000	457,000	1,403,000	554,000	190,000	201,000
1873	1,001,000	422,000	1,423,000	651,000	177,000	189,000
1874	1,040,000	395,000	1,435,000	636,000	174,000	230,000

AVERAGE ANNUAL SHIPMENTS, PERIODS OF FIVE YEARS.

Five Years.	Average per Year at Birkenhead.	Average per Year at Liverpool.	Average Total per Year.
1862 to 1866	400,000	140,000	540,000
1867 to 1871	743,000	297,000	1,040,000

E

REGULATIONS to be observed in the loading of Coal and discharging of Ballast at the Coal Tips, Low Level, and Ballast Crane, at Birkenhead.

1. All vessels intended to be loaded with coal shall be berthed in the order in which they are booked for berths at the dock master's office, provided, however, that no coal agent shall load more than one vessel at the tips at the same time, if any other agent requires a berth.

2. No vessel shall be berthed until a certificate is lodged at the dock master's office, that there are fifty tons of coal ready for immediate shipment at the low level berths, and one hundred tons at the tips.

3. Until vessels in berth shall have discharged their ballast, the minimum quantity of coal shipped, or of ballast discharged, shall be one hundred tons as the average, daily at the low level, and two hundred tons at the tips; and

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afterwards, the average minimum quantity of coal shipped daily at the low level shall be one hundred and fifty tons, and at the tips two hundred and fifty tons.

4. Vessels not complying with these regulations will be immediately removed from the berth, but will be entitled to the first vacant berth on having the required quantity of coal to proceed with their loading.

5. Vessels in ballast intending to load by the coal tips to take precedence at the ballast crane; and vessels intending to load coal for stiffening to have the use of the crane in preference to vessels to be loaded with an entire cargo by the crane.

6. The use of No. 2 tip is not to interfere with the working of Nos. 1 and 3 tips when the latter are being used by large ships.

By Order of the Board.

Dock Office,
26th September 1867.

F.

Shipment of Coal and Discharge of Ballast, &c. at Birkenhead.

Secretary's Office,
Liverpool, December 9th, 1874.

The Mersey Docks and Harbour Board are prepared to ship coal and discharge ballast at their hoists, hand tips, and ballast crane, at Birkenhead, also to move, under their regulations, vessels using the appliances in the west float, at the following rates, viz :—

Coal.

	Per Ton. s.	d.
1. For loading coal into ships or steamers, by the hoists, including haulage of wagons, tipping and stowage, and the lowering of ten per cent. of the registered tonnage into the hold at the commencement of loading to avoid breakage	0	5
2. Ditto for the bunkers of steamers, by the coal hoists	0	7½
3. Ditto ditto, by hand, from wagons on the quay	1	1
4. Ditto into flats, by tips	0	3
5. Ditto into steam barges or steam lighters, by hoists or tips	0	3
6. Ditto for stiffening, if desired, by the ballast crane, into vessels discharged by the crane, to the extent of ten per cent. of the registered tonnage	0	6
7. Ditto by the ballast crane, and trimming an entire cargo, or any excess over ten per cent. of the registered tonnage	0	8
8. Ditto into flats by the ballast crane	0	6
9. If weighed by the Board's weighing machines	0	0½
For loading, by the appliances, coal for home consumption (in addition to the above rates)	0	2

Note.—For the shipment of coke double the above rates will be charged.

Ballast.

	Per Ton. s.	d.
10. For discharging ballast from ships or vessels by the hydraulic crane (One tub of ballast in every ten to be weighed on one of the Board's weighing machines.)	0	6
11. Ditto by hand, when the cranes are not available, ballast from vessels berthed at the appliances	0	10

Moving Vessels.

12. For moving, under the Board's regulations, vessels in the west float requiring the use of the coal hoists or ballast crane, for each 100 tons register measurement, or for any fractional part over 50 tons	4	0

Vessels can be loaded with coal at the rate of from 300 to 600 tons a day, if a sufficient supply be brought down.

Ballast can be discharged at the rate of 200 tons and upwards a day.

Two of the hoists are provided with lowering tubs, worked by machinery, with the view to prevent the breakage of coal, and the use of these tubs, with the machinery, is allowed free of charge for landing from vessels any pyrites stones, &c. that may be found amongst the coal placed on board by the appliances.

An apparatus for screening coal is also provided.

At each of the hoists, and at the hand tips, Vittoria Creek, there is a machine for weighing coal, if required.

The contractor for shipping coal and discharging ballast, &c. is a licensed master stevedore and master lumper.

The rates are to be paid in advance to the board's treasurer, dock office, Liverpool. Every information can be obtained there, at the office of the traffic manager, district E, Duke Street entrance, and at the coal tips, Birkenhead.

The board recommend parties interested in the shipment of coal to inspect personally the working of the appliances, so that they may estimate the advantages to be gained by their use.

Edward Gittins,
Secretary.

G.

Regulations for working the High Level Coal Trade at the Bramley-Moore and Wellington Docks.

1. As many vessels and flats to be admitted into the Bramley-Moore, Wellington, and Wellington half-tide docks to work at the high level railway, as shall be consistent with the general work of those docks.

2. No vessel to be allowed to enter the Bramley-Moore, Wellington, or Wellington half-tide docks, nor to be entered on the Application Book for admittance into those docks, to load coal from the high level railway, except upon the production of a jerque note, or a certificate from the master of the dock in which the vessel is lying at the time, showing that she is discharged, and also a certificate from the coal agent that she is to load coal at the high level railway. No coal agent to be allowed to load more than two flats at the cranes at the same time, nor to have more than three vessels in the Bramley-Moore, Wellington, or Wellington half-tide docks (inclusive) loading and to load coal at the cranes, at one time.

No flat to be admitted until a certificate is produced from the coal agent that she is to load coal at the high level railway.

3. Applicants for vessels to be admitted into dock to call at the dock master's office 2 hours after high water, when high water happens between 8 a.m. and 2 p.m.; and when before or after these hours, to call at 10 a.m., when the list of vessels waiting to enter dock will be called over, and orders given for such as are on turn, and represented, to the enter dock.

4. No vessel to be entered in the Berthing Book, kept at the office of the Superintendent of the high level railway, before she is in the Bramley-Moore, Wellington, or Wellington half-tide docks, and each vessel is to be berthed in regular turn, as entered, if the specified quantity of coal is at the Sandhills Station; if not, the next vessel on turn, having sufficient coal ready, to take the berth; any vessel losing her turn in consequence of coal for her not being at the Sandhills Station, to be considered first on turn when the coal is ready. Flats and vessels to follow the same order as to turn for loading, whether entered for the cranes or the shoot.

5. When a crane is idle from want of coal, the first vessel on turn not in the dock having the quantity of coal specified by these regulations at Sandhills Station ready for shipment, (to be proved by a certificate from the coal agent which must also be endorsed by the Superintendent of the high level railway,) may, at the discretion of the dock master, be admitted into dock out of regular turn, as shown in the Application Book. The Superintendent of the high level railway is not to put coal that he has certified for one vessel into any other vessel.

6. No coal to be brought on the high level railway without the permission of the Superintendent, who will inform the railway clerk which vessel is first on turn for a berth, so that the coal may be sent to the high level railway previous to the vessel being berthed.

7. No vessel or flat to be berthed under a crane or a

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shoot before the quantity of coal, according to the following scale, is at Sandhills Station, ready for shipment, viz.:—

Vessels or flats under 100 tons register	Full cargo.
Do. do. of 100 „ „ and under 300 tons register	100 tons of coal.
Vessels of 300 tons register and upwards	150 „ „

The Superintendent of the high level railway to be furnished with a return from the Sandhills Station, at 8 a.m., 1 p.m., and 4 p.m. each day, of the number of loaded wagons (distinguishing box from square wagons) at the station ready for shipment, with the names of the shippers of the coal.

8. Each coal wagon to have a card attached to it, stating the number and weight of the wagon, and weight of the coal thereon; the card to be taken off by the Superintendent, and filed, for a check on the weight shipped.

The gross weight of each waggon of coal intended to be lifted by a cradle crane must not exceed twelve tons; if it exceed that weight, such loaded wagon, will be liable to be returned to Sandhills Station. Wagons sent on to the high level railway without having the requisite cards attached thereto, will also be liable to be returned to that station.

9. Should any delay arise in working any crane or the shoot, from the want of coal for a vessel loading there, or by default of such vessel, that vessel to be immediately removed from the berth, and the next on turn for which coal is ready to be placed therein.

10. Each vessel entered for a berth, to undertake to provide a sufficient number of trimmers; or failing to have a sufficient number of trimmers, and thereby causing obstruction to the full working of the appliances, is liable to be removed from the berth.

11. No transhipment of coal, coke, or other articles from one wagon to another, to be allowed on the high level railway.

12. Vessels, when taking in coal or coke from the high level railway, to be allowed also to take in machinery or cargo from the low quay, when it can be done without causing any delay to the work of the high level railway.

13. Every vessel to leave the dock within 24 hours after she has received the quantity of coal intended to be shipped on board her, if called upon by the harbour master to do so.

14. In the event of a vessel having to vacate her berth, and requiring not over 120 tons coal to complete her loading which is to be proved to the satisfaction of the dock master, one or two flats may be allowed to bring coal into dock for such vessel to the extent of, but not exceeding, 120 tons.

By Order of the Board,

Dock Office Liverpool, March 25th, 1875.

EDWARD GITTINS, Secretary.

DUTIES of the SUPERINTENDENT of the HIGH LEVEL RAILWAY.

1. The Supintendent of the high level railway to keep an account of the vessels that use the coal cranes and shoot; and when a vessel has finished loading or discharging, the amount of tons of coal, or other articles, to be inserted in the Superintendent's Registry Book, and compared with the railway clerk's account; the entry in the Registry Book to be signed by the latter.

2. To enter vessels in the Application Book, and to berth them in regular turn as entered, as per No. 4 regulation; and to prevent vessels grounding under or near the appliances, so that they may be removed any time when required.

3. A dock gateman to be stationed at the east end of the Bramley-Moore and Wellington docks, to attend to the Superintendent's orders, so far as regards the removal and berthing of vessels in connexion with the high level railway.

4. The Superintendent to see that the regulations for working the high level railway are strictly carried out, and, in case of any obstruction or unnecessary delay, to send for the dock master, or the north assistant harbour master, and note the cause in his Memorandum Book.

By Order of the Board,

Dock Office, Liverpool, March 25th, 1875.

EDWARD GITTINS, Secretary.

H.

STATEMENT of CHARGES for the use of the BOARD'S HIGH LEVEL RAILWAY.

COAL EXPORTED.

	Per ton.	
1. FOREIGN:—		
For use of High Level Railway	2*d.*	Collected by the Lancashire and Yorkshire Railway Company, and paid to the Board.
Dock dues	1½*d.*	Collected by the Board.
Town dues	2*d.*	Ditto.
2. COASTWISE:—		
For use of High Level Railway	2*d.*	Collected by the Lancashire and Yorkshire Railway Company, and paid to the Board.
Dock dues	Nil.	
Town dues	2*d.*	Collected by the Board.
3. HOME CONSUMPTION, EXCEPT FOR SALT WORKS:—		
For use of High Level Railway	2*d.*	Collected by the Lancashire and Yorkshire Railway Company, and paid to the Board.
Ditto	3*d.*	Collected by the Board.
	5*d.* per ton.	
4. FOR SALT WORKS:—		
For use of High Level Railway	2*d.*	Collected by the Lancashire and Yorkshire Railway Company, and paid to the Board.
Ditto	2*d.*	Collected by the Board.
	4*d.* per ton.	
5. FOR USE OF SEA-GOING STEAMERS, OR FOR SHIP'S STORES:—		
For use of High Level Railway	2*d.*	Collected by the Lancashire and Yorkshire Railway Company and paid to the Board.
Dock dues	Nil.	
Town dues	Nil.	

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(*g.*) Letters and Statistics from Mr. R. Cooper Rundell, Assistant to the Secretary, Liverpool Underwriters' Association.

Sir, Liverpool, 30th October 1875.

When I had the honour of placing before the Royal Commission, last June, my evidence respecting spontaneous combustion of coal cargoes, I gave some statistics as to the number of vessels with cargoes of 500 tons of coal and upwards which had sailed from the Mersey on voyages beyond the Equator during the first nine months of 1873 and of 1874, and compared the total number of these cargoes with the number of cargoes in which spontaneous combustion had been reported.

I was then asked if I could inform the Commission how many of the vessels which sailed were iron, how many were loaded on the Liverpool side of the Mersey, and how many by the tip, in order that a further comparison might be made with regard to these particulars.

The tables which I have now the pleasure of sending you herewith supply this information for each month of the two periods. The voyages are classified as before.

Table I. gives the number of vessels which sailed from the Liverpool side of the Mersey, and the number which sailed from the Birkenhead side.

Table II. The number of those vessels which were iron, and the number which were wood.

Table III. The number loaded by tip, and the number loaded by hand.

Table IV. The number of tons of shipping and the number of tons of coal for each month.

Table V. The average tons of shipping and of coal for each month.

In each of the tables the number of cases of heating and fire are printed within parentheses.

My evidence before the Commission showed that the greatest increase in the number of cases of spontaneous combustion in 1874 occurred in shipments of coal from the Mersey for the West Coast of America, and in sending you these tables I take the opportunity to point out some facts supplied by these tables with regard to the shipments in question.

Table I. shows that 41 vessels sailed from the Liverpool side during the first period, and 82 during the second period, while from the Birkenhead side 34 sailed during the first period, and only 17 during the second. There were no casualities to any of the 1873 shipments, while for the second period there were 12 out of the 82 shipments from the Liverpool side, or about 15 per cent., and one only out of the 17 from the Birkenhead side, or 6 per cent.

It would appear therefore from this table that the Liverpool shipments had increased 100 per cent., while the Birkenhead ones had decreased in the same ratio, and that the per-centage of casualties in shipments from the Liverpool side was more than double that from the Birkenhead side.

Table II. shows that 40 iron vessels sailed from the Mersey during the first period, and 40 during the second. Also that 35 wooden vessels sailed during the first period and 59 during the second, representing an increase of 69 per cent. Three casualties occurred in the 40 iron vessels, *i.e.*, in 7½ per cent. of their number, and 10 in the 59 wooden vessels, or in 17 per cent. of their number.

This second table consequently shows that the increased number of vessels which sailed in the second period were of wood, and that the per-centage of casualties from heating was more than twice as great for wooden vessels as for iron.

Table III. shows that, during the first period, 19 vessels were loaded at the tip on the Liverpool side, and during the second period, 43. Also, that 22 were loaded at the tip from the Birkenhead side during the first period, and 10 during the second period. Casualties happened in 12 out of the 43 vessels loaded from the tip on the Liverpool side, or 28 per cent. of the number, and no casualty is reported in the 10 vessels loaded from the tip on the Birkenhead side. No cases of heating are reported in any of the 39 vessels loaded by hand on the Liverpool side during the second period, and although one case occurred in the 7 vessels loaded on the Birkenhead side, there are circumstances connected with it which indicate that the casualty had no connexion with the way in which the vessel was loaded. I allude to the case of the "Merchant."

Table III. therefore shows that the number of shipments from the tip on the Liverpool side increased more than 100 per cent.; while on the Birkenhead side they decreased in about the same ratio, and that the per-centage of casualties in vessels loaded from the tip on the Liverpool side was 28 per cent., while in those loaded from the tip on the Birkenhead side there were none.

Table IV. shows that while there was but a slight difference in the average size of the vessels which sailed during the second, or of their cargoes, as compared with the average size of the vessels and their cargoes for the first period, yet the tonnage during the hot months of the year shows a great increase in 1874.

Table V. gives the average size of ship and cargo for each month of the periods in question. The average cargoes during the hot months of the second period are larger than the average cargoes during the same months of the first period; but it will be seen that they are not in any case so large as those of some of the early months of the first period.

In many cases, the vessels which sail for the West Coast take only a part cargo of coal, and consequently the average given above does not definitely indicate whether more large cargoes were shipped in the second period than in the first.

Now 10 out of the 13 casualties which occurred in cargoes from the Mersey for the West Coast were in cargoes of 1,300 tons and upwards; and, taking this limit, the following table gives the number of vessels, with 1,300 tons of coal and upwards, which sailed from the Mersey for the West Coast during each month of the two periods selected for comparison.

	1873.	1874.
January	4 sailed.	1 sailed.
February	1 „	None „
March	None „	None „
April	6 „	2 „
May	1 „	1 „
June	2 „	2 „
July	None „	5 „
August	1 „	8 „
September	1 „	5 „
	16 „	24 „

It will hence be seen that 16 such cargoes were shipped during the first period and 24 during the second, representing an increase of 50 per-cent. Also that 20 out of the 24 sailed during the hot months of 1874, while during the same months of 1873 only 4 sailed.

To sum up, therefore, the tables show that in the second period the greatest per-centage of casualties to cargoes from the Mersey to the West Coast occurred, (1), in vessels loaded on the Liverpool side; (2), in wooden vessels; (3), in vessels loaded at the tip; (4), in vessels with cargoes of 1,300 tons of coal and upwards.

Features (1) and (3) relate to *condition* of the coal; while (2) and (4) relate to the vessel and the size of cargo. With regard to these latter elements, it may be observed that several of the vessels, in the cargoes of which cases of spontaneous combustion were reported in 1874, sailed in previous years with cargoes of coal equally large, and no signs of spontaneous combustion were reported. I append the names of some of these vessels, and the kind of coal which they took.

I am, &c.,

R. Cooper Rundell.

The Secretary,
Royal Commission on Spontaneous Combustion of Coals, London.

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TABLE I.—Liverpool and Birkenhead Sailings.

Table showing the Number of Vessels with Cargoes of 500 tons of Coal and upwards which have sailed from the Mersey during each of the first nine Months of 1873 and 1874 on voyages to the South Atlantic, to the Eastward of the Cape of Good Hope, and to the West Coast of America; distinguishing between those loaded at Liverpool and those at Birkenhead.

Note.—The number of cases of heating are printed between parentheses.

Month.	South Atlantic.			East of Cape of Good Hope.			West Coast of America.			Total.		
	Mersey.		Total.	Mersey.		Total.	Mersey.		Total.	Mersey.		Total for Month.
1873.	Liverpool.	Birkenhead.		Liverpool.	Birkenhead.		Liverpool.	Birkenhead.		Liverpool.	Birkenhead.	
January	0	1	1	1	4*	5	11	2	13	12	7	19
February	2	0	2	1	7	8	1	5	6	4	12	16
March	2	6	8	2*	8	10	1	0	1	5	14	19
April	2	2	4	4	5	9	4	5	9	10	12	22
May	3	3	6	1	9	10	3	2	5	7	14	21
June	1	0	1	1	7	8	4	2	6	6	9	15
July	6	2	8	1	4	5	5	8	13	12	14	26
August	2	3	5	0	11	11	8	5	13	10	19	29
September	3	1	4	0	14	14	4	5	9	7	20	27
Totals	21	18	39	11	69	80	41	34	75	73	121	194
1874.												
January	2	0	2	1	10†	11	0	1	1	3	11	14
February	4	4	8	0	4	4	5	2	7	9	10	19
March	2	3	5	1	9	10	4	0	4	7	12	19
April	0	1	1	0	14	14	(1) 7	2	9	(1) 7	17	(1) 24
May	3	1	4	1	12	13	(1) 4	2	6	(1) 8	15	(1) 23
June	0	0	0	2	15	17	(2) 11	(1) 2	13	(3) 13	(1) 17	(4) 30
July	1	0	1	(1) 1	(1) 10	11	(3) 15	4	19	(3) 17	(1) 14	(4) 31
August	2	1	3	3	13	16	(3) 21	2	23	(3) 26	16	(3) 42
September	2	0	2	2	(1) 19	21	(2) 15	2	17	(2) 19	(1) 21	(3) 40
Totals	16	10	26	(1) 11	(2) 106	117	(12) 82	(1) 17	99	(13) 109	(3) 133	(16) 242

* One steamer in January and one in March 1873 went by way of Canal with cargo of coals.
†. Five steamers with cargoes of coals went through Canal in January 1874.

TABLE II.

List of the Number of Vessels which have sailed from the Mersey with 500 tons of Coal and upwards on voyages beyond the Equator during each Month of the period January 1st to September 30th, 1873; distinguishing Iron from Wooden Vessels.

1873.	South Atlantic Voyages.		East Indian Voyages.		West Coast Voyages.		Total for each Month.	
	Iron.	Wood.	Iron.	Wood.	Iron.	Wood.	Iron.	Wood.
January	—	1	2*	3	3	10	5	14
February	—	2	2	6	1	5	3	13
March	—	8	3*	7	1	—	4	15
April	—	4	3	6	1	8	4	18
May	—	6	3	7	1	4	4	17
June	—	1	3	5	5	1	8	7
July	—	8	1	4	9	4	10	16
August	—	5	5	6	12	1	17	12
September	—	4	4	10	7	2	11	16
	—	39	26	54	40	35	66	128

* One steamer in January and one in March.

Similar List for the same period of 1874.

1874.	South Atlantic Voyages.		East Indian Voyages.		West Coast Voyages.		Total for each Month.	
	Iron.	Wood.	Iron.	Wood.	Iron.	Wood.	Iron.	Wood.
January	—	2	6†	5	—	1	6	8
February	—	8	—	4	2	5	2	17
March	—	5	1	9	—	4	1	18
April	—	1	5	9	4	(1) 5	9	(1) 15
May	—	4	1	12	2	(1) 4	3	(1) 20
June	—	—	4	(1) 13	(1) 4	(2) 9	(1) 8	(3) 22
July	—	1	1	(1) 10	(1) 9	(2) 10	(1) 10	(3) 21
August	—	3	—	16	(1) 11	(2) 12	(1) 11	(2) 31
September	—	2	(1) 1	20	8	(2) 9	(1) 9	(2) 31
	—	26	(1) 19	(2) 98	(3) 40	(10) 59	(4) 59	(12) 183

† Five steamers in January.

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TABLE III.

NUMBER of Vessels which have sailed from the Mersey with 500 Tons of Coal and upwards on Voyages beyond the Equator; distinguishing between those loaded at the Tip and those loaded by Hand. 1873 period.

1873. Month and Port.	South Atlantic.				East Indian.				West Coast.				Total loaded by			
	Tip.		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
January.																
Liverpool	0		0		1		0		5		6		6		6	
Birkenhead	1	1	0	0	*1	2	3	3	0	5	2	8	2	8	5	11
February.																
Liverpool	0		2		1		0		0		1		1		3	
Birkenhead	0	0	0	2	0	1	7	7	4	4	1	2	4	5	8	11
March.																
Liverpool	0		2		1		*1		1		0		2		3	
Birkenhead	1	1	5	7	0	1	8	9	0	1	0	0	1	3	13	16
April.																
Liverpool	1		1		2		2		2		2		5		5	
Birkenhead	2	3	0	1	0	2	5	7	3	5	2	4	5	10	7	12
May.																
Liverpool	1		2		0		1		2		1		3		4	
Birkenhead	1	2	2	4	0	0	9	10	0	2	2	3	1	4	13	17
June.																
Liverpool	0		1		1		0		2		2		3		3	
Birkenhead	0	0	0	1	1	2	6	6	2	4	0	2	3	6	6	9
July.																
Liverpool	1		5		0		1		2		3		3		9	
Birkenhead	0	1	2	7	0	0	4	5	6	8	2	5	6	9	8	17
August.																
Liverpool	0		2		0		0		3		5		3		7	
Birkenhead	3	3	0	2	1	1	10	10	4	7	1	6	8	11	11	18
September.																
Liverpool	0		3		0		0		2		2		2		5	
Birkenhead	1	1	0	3	3	3	11	11	3	5	2	4	7	9	13	18
Total for																
Liverpool	3		18		6		5		19		22		28		45	
Birkenhead	9	12	9	27	6	12	63	68	22	41	12	34	37	65	84	129

* One steamer in January and one in March.

TABLE III.—*cont.*

NUMBER of Vessels which have sailed from the Mersey with 500 Tons of Coal and upwards on Voyages beyond the Equator; distinguishing between those loaded at the Tip and those loaded by Hand. 1874 period.

1874. Month and Port.	South Atlantic.				East Indian.				West Coast.				Total loaded by			
	Tip.		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
January.																
Liverpool	2		0		1		0		0		0		3		0	
Birkenhead	0	2	0	0	5	†6	5	5	0	0	1	1	5	8	6	6
February.																
Liverpool	3		1		0		0		3		2		6		3	
Birkenhead	0	3	4	5	0	0	4	4	2	5	0	2	2	8	8	11
March.																
Liverpool	0		2		0		1		1		3		1		6	
Birkenhead	1	1	2	4	1	1	8	9	0	1	0	3	2	3	10	16
April.																
Liverpool	0		0		0		0		(1) 1		6		1		6	
Birkenhead	1	1	0	0	5	5	9	9	1	2	1	7	7	8	10	16
May.																
Liverpool	0		3		0		1		(1) 1		3		1		7	
Birkenhead	1	1	0	3	3	3	9	10	1	2	1	4	5	6	10	17
June.																
Liverpool	0		0		(1) 1		1		(2) 7		4		8		5	
Birkenhead	0	0	0	0	0	1	15	16	1	8	(1) 1	5	1	9	16	21
July.																
Liverpool	1		0		0		1		(3) 10		5		11		6	
Birkenhead	0	1	0	0	(1) 2	2	8	9	3	13	1	6	5	16	9	15
August.																
Liverpool	0		2		0		3		(3) 10		11		10		16	
Birkenhead	1	1	0	2	1	1	12	15	1	11	1	12	3	13	13	29
September.																
Liverpool	1		1		1		1		(2) 10		5		12		7	
Birkenhead	0	1	0	1	(1) 7	8	12	13	1	11	1	6	8	20	13	20
Total for																
Liverpool	7		9		(1) 3		8		(12) 43		39		53		56	
Birkenhead	4	11	5	15	(2) 24	27	82	90	10	53	(1) 7	46	38	91	95	151

† Five steamers from Birkenhead with cargoes of coals.

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TABLE IV.

THE MONTHLY AGGREGATE TONNAGE of the Vessels which have sailed from the Mersey with 500 Tons of Coal and upwards on Voyages beyond the Equator during the first Nine Months of 1873 and 1874, and the aggregate Tons of Coal they carried.

1873.	South Atlantic Voyages.			East Indian Voyages.			West Coast Voyages.			Total of each Month.		
	No. of Ships.	Amount of registered tonnage.	Amount of tons of coal.	No. of ships.	Amount of registered tonnage.	Amount of tons of coal.	No. of ships.	Amount of registered tonnage.	Amount of tons of coals.	No. of ships.	Amount of registered tonnage.	Amount of tons of coal.
January -	1	269	511	5	5,892	7,846	13	11,189	15,161	19	17,350	23,518
February -	2	1,441	2,042	8	9,164	13,225	6	5,228	6,876	16	15,833	22,143
March -	8	7,902	10,921	10	12,271	16,167	1	796	1,040	19	20,969	28,128
April -	4	2,306	3,149	9	8,582	11,467	9	9,683	12,072	22	20,571	26,688
May -	6	4,887	6,590	10	11,298	14,779	5	4,613	4,507	21	20,798	25,876
June -	1	317	693	8	9,915	12,782	6	5,304	7,009	15	15,536	20,484
July -	8	5,879	7,315	5	5,180	7,025	13	8,977	10,798	26	20,036	25,138
August -	5	2,765	4,186	11	11,112	15,616	13	8,801	11,399	29	22,678	31,201
September	4	2,700	3,953	14	15,176	19,943	9	5,588	7,921	27	23,464	31,817
Total -	39	28,466	39,360	80	88,590	118,850	75	60,179	76,783	194	177,235	234,993
and Average -		730	996		1,107	1,486		802	1,024		914	1,211

1874.	South Atlantic Voyages.			East Indian Voyages.			West Coast Voyages.			Total of each Month.		
	No. of ships.	Amount of registered tonnage.	Amount of tons of coals.	No. of ships.	Amount of registered tonnage.	Amount of tons of coal.	No. of ships.	Amount of registered tonnage.	Amount of tons of coal.	No. of ships.	Amount of registered tonnage.	Amount of tons of coal.
January - -	2	1,283	1,685	11	11,416	15,065	1	827	704	14	13,526	17,454
February - -	8	6,370	8,598	4	5,203	7,930	7	4,278	5,517	19	15,851	22,045
March - -	5	3,497	5,094	10	11,419	14,784	4	3,384	4,131	19	18,300	24,009
April - -	1	571	623	14	15,012	19,928	9	9,294	8,143	24	24,877	28,694
May - -	4	2,176	2,891	13	13,300	17,362	6	4,304	5,504	23	19,780	25,757
June - -	—	—	—	17	16,938	22,581	13	9,244	11,522	30	26,182	34,103
July - -	1	414	633	11	10,130	13,099	19	18,146	20,204	31	28,690	33,936
August - -	3	1,693	2,600	16	16,171	24,042	23	23,897	25,985	42	41,761	52,627
September -	2	1,021	1,591	21	27,620	24,648	17	14,504	17,967	40	43,145	44,206
Total -	26	17,025	23,715	117	127,209	159,439	99	87,878	99,677	242	232,112	282,831
and Average -		655	912		1,087	1,363		888	1,007		959	1,168

TABLE V.

LIST showing the Average Tonnage of the Ships, and the Average Tonnage of their Cargoes, for each month of the period January 1st to September 30th, 1873. The ships being the same as those referred to in Table IV.

1873.	South Atlantic Voyages.		East Indian Voyages.		West Coast Voyages.	
	Average tonnage of ship.	Average number of tons of cargo.	Average tonnage of ship.	Average number of tons of cargo.	Average tonnage of ship.	Average number of tons of cargo.
January - -	269	511	1,178	1,569	861	1,166
February - -	721	1,021	1,145	1,653	871	1,146
March - - -	988	1,365	1,227	1,617	796	1,040
April - - -	577	787	954	1,274	1,076	1,341
May - - -	815	1,098	1,130	1,478	923	901
June - - -	317	693	1,239	1,598	884	1,168
July - - -	735	914	1,036	1,405	691	824
August - - -	553	837	1,010	1,420	677	877
September - -	675	988	1,084	1,425	621	880

SIMILAR LIST of Averages for the same Period of 1874.

1874.	South Atlantic Voyages.		East Indian Voyages.		West Coast Voyages.	
	Average tonnage of ship.	Average number of tons of cargo.	Average tonnage of ship.	Average number of tons of cargo.	Average tonnage of ship.	Average number of tons of cargo.
January - -	642	843	1,038	1,369	827	704
February - -	796	1,075	1,301	1,983	611	788
March - - -	697	1,019	1,142	1,478	846	1,033
April - - -	571	623	1,072	1,423	1,033	904
May - - -	544	723	1,023	1,336	717	917
June - - -	—	—	996	1,328	711	886
July - - -	414	633	921	1,191	955	1,073
August - - -	564	867	1,011	1,503	1,039	1,129
September - -	511	796	1,315	1,174	853	1,057

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PARTICULARS of COAL CARGOES taken on previous Voyages by some of the Vessels which were reported in 1874 with their Cargoes of Coal heated or on fire:—

"Centaur," left Liverpool, August 1871, for Rio Janeiro, with 1,771 tons of Westminster Brymbo main coal, loaded at Birkenhead.

"Glory of the Seas," left the Mersey in July 1872, for San Francisco, with 1,502 tons of Westminster Brymbo steam coal, loaded at Birkenhead.

"Mogul," left Cardiff for Rio Janeiro in November 1872, with about 1,750 tons of South Wales Coal, shipped by Messrs. Goodwin, Barnes, & Co.

"St. Nicholas," left the Mersey in June 1873, with 2,262 tons of South Wales coal, shipped under the tip at Birkenhead, for Callao.

"Euxine," left the Mersey 21st April 1873, for Aden, with 1,950 tons of North Wales coal, shipped at Birkenhead by hand.

"Monmouthshire," left Newcastle, 8th June 1871, for San Francisco, with a cargo of East Coast coal;—left Ardrossan, 13th August 1872, for San Francisco, with a cargo of Scotch coal;—left Birkenhead, 14th August 1873, for San Francisco, with 1,382 tons of North Wales coal, loaded from the tip.

"Staffordshire," left Dundee, 3rd June 1871, for Calcutta, with a cargo of Scotch coal, and subsequently left Sydney, New South Wales, for San Francisco, with a cargo of Australian coal.

Litherland Park, near Liverpool,
3rd April 1876.

SIR,

IN continuation of the statistics before sent to the Royal Commission, I now beg to forward to you the accompanying tables.

My former statistics related to the number of vessels with cargoes of 500 tons of coal and upwards which had sailed from the United Kingdom on voyages beyond the Equator during the first nine months of the years 1873 and 1874, and to the number of these cargoes in which spontaneous combustion had been reported. I have now extended my data so as to comprise the whole twelve months of each of these years, and have further added similar statistics for the year 1875.

These additions do not materially affect the conclusions previously arrived at.

Tables I., II., III. show the number of vessels (under the same limiting conditions as before) which have sailed from each port for each month of the three years 1873, 1874, and 1875, and the number of cases of heating and fire which have occurred out of these sailings.

Table IV. shows the number of vessels which have sailed from each port for (1) the South Atlantic, (2) the East Indies, and (3) the West Coast, during each of the three years in question.

Tables V., VI., and VII. relate to further particulars respecting the Mersey shipments merely. The number of vessels which have sailed from the Mersey are here given, and the number which have sailed from the Liverpool side distinguished from the number which have sailed from the Birkenhead side, and whether loaded by hand or by tip. The cases of heating are printed between parentheses.

A comparison of Tables I., II., and III. shows that for 1873 there were 26 casualties out of 1,506 sailings, or about 1·7 per cent.; for 1874 there were 54 casualties out of 1,773 sailings, or just over 3 per cent., and for 1875 there were 22 casualties out of 1,619 sailings, or about 1·36 per cent.

Hence it would appear that the great increase of the per-centage of accidents in 1874 has not been maintained in 1875; but that, on the contrary, the per-centage for 1875 is lower even than that for 1873.

An examination of the statistics for the several districts indicates which district shows the greatest relative improvement in 1875 over 1874.

The per-centage for the East Coast has diminished from about 4 to about 1½. That for South Wales from about 1·3 to 0·96. That for Liverpool, from nearly 10 to 3·6; for Birkenhead, from nearly 2 to 1; for Scotland, from 6·6 to 1·3.

The greatest improvement has, therefore, been in Scotch coal. Lancashire coal comes next, and then the East Coast coal. The improvement in the East Coast coal is the more marked from the fact that the per-centage of loss was as high in 1873 as in 1874; while the other districts, particularly the Mersey and Scotch districts, showed such a great increase in 1874 over 1873. Further, if the Yorkshire and London statistics be taken from the returns for the East Coast with which they are included, the decrease in the per-centage of heatings in cargoes from the East Coast (Northern ports) becomes still greater.

Reference to Table IV. will show on what class of voyage the number of casualties have been greatest, and from which districts.

It will be seen that the West Coast voyages are still those which give the preponderance of casualties. The per-centage for West Coast voyages in 1875 is over 3; while, for the East Indian voyages it is under 1, and for South Atlantic voyages it is so low as 0·2.

The East Coast coal contributes the largest per-centage of West Coast casualties. The per-centage is even greater than that for 1874, and this is entirely owing to the Yorkshire shipments.

The remaining tables, V., VI., and VII., refer merely to the Mersey coal shipments, and show that in 1873, 86 vessels loaded at the tip, out of the 264 which sailed, or under 33 per cent.; that in 1874, 144 out of the 357 which sailed, or over 40 per cent.; and that in 1875, 118 out of the 335 which sailed, or about 35 per cent.

I believe these Liverpool statistics respecting the way in which the cargoes were loaded to be fairly accurate; but as they have been compiled within the last few days from the newspaper dock lists and other non-official sources, they may possibly be subject to a few slight errors.*

In addition, I also beg to send you a classified list of those vessels which have sailed from the United Kingdom during 1875, in the cargoes of which spontaneous combustion has been reported. The list gives particulars of ship and cargo.

I am, &c.
R. COOPER RUNDELL.

The Secretary,
Royal Commission on Spontaneous Combustion of Coals, London.

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* The sailings for the chief of the other coal ports have been obtained from Brown's Monthly Export Lists. In these lists, when more than one vessel have sailed during the month from either port for the same voyage, only the aggregate of their cargoes is given, and not the number of tons of cargo belonging to each vessel. In the tables each vessel is included if the aggregate tonnage of the cargo gives an average of more than 500 tons, and unless the average amounts to 500 tons the vessels are excluded. The tables are thus subject to any slight errors which this may occasion.

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TABLE I.—TABLE showing the Number of Vessels which have sailed (S.) from the under-mentioned Ports with 500 Tons of Coal and upwards on Voyages across the Equator, and through the Suez Canal, during each Month of the Year 1873, and the Number of Cases of Heating and Fire (H.) which have occurred out of these Sailings.

——	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total for each Port.	
EAST COAST DISTRICT.																										
NORTHERN PORTS.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.
Amble (Warkworth) and Seaham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tyne — Newcastle	21		10		10		12		19		10		25		7		25		22		14		9		184	
Tyne — North Shields	4	1	3	0	3	0	2	0	3	1	2	1	3	0	6	0	3	4	5	0	2	0	9	1	50	8
Tyne — South Shields	4		2		0		1		2		2		0		1		3		1		1		1		18	
Sunderland	6	0	5	0	4	0	5	0	5	0	5	0	7	0	4	0	5	0	10	0	8	0	16	0	80	0
Blyth	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	5	0
West Hartlepool (including Hartlepool)	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	5	0
Stockton and Middlesborough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YORKSHIRE PORTS.																										
Hull	1	0	0	0	0	0	0	0	1	1	1	1	1	0	2	2	0	0	1	0	2	0	1	0	10	4
Goole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grimsby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0
LONDON	1	1	5	0	2	0	0	0	4	0	2	1	4	0	4	1	0	0	0	0	1	0	0	0	23	3
Total for East Coast District	40	2	26	0	19	0	20	0	35	2	22	3	40	0	24	3	41	4	41	0	31	0	38	1	377	15
SOUTH WALES DISTRICT.																										
Newport	0	0	1	0	11	0	6	0	13	0	2	1	5	0	5	0	2	1	1	0	1	0	5	0	52	2
Llanelly, including Carmarthen, Pembrey, Lougher, and Ferryside.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardiff, including Penarth	32	0	42	0	48	0	60	0	61	1	52	0	52	1	35	1	38	0	68	0	44	0	41	0	623	3
Swansea, including Neath, Port Talbot, and Porthcawl	6	0	7	0	7	0	6	0	8	0	8	1	12	0	8	0	10	1	2	0	7	0	6	0	87	2
Total for South Wales District	38	0	50	0	66	0	72	0	82	1	62	2	69	1	48	1	100	2	71	0	52	0	52	0	762	7
LIVERPOOL DISTRICT.																										
Liverpool	12	0	4	0	5	0	10	0	7	0	6	0	12	0	10	0	7	0	11	0	5	0	7	0	96	0
Birkenhead	7	0	12	0	14	0	12	0	14	0	9	0	14	0	19	0	20	0	18	1	13	0	16	0	168	1
Whitehaven	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total for Liverpool District	19	0	16	0	19	0	22	0	21	0	15	0	26	0	29	0	27	0	29	1	18	0	23	0	264	1
SCOTCH DISTRICT.																										
EASTERN PORTS.																										
Leith and Granton	1	0	1	0	1	0	3	0	3	0	2	0	3	0	1	0	2	0	0	0	0	0	1	0	18	0
Grangemouth, Borrowstouness, Inverkeithing, Charlestown, and St. David's.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alloa (including Kennet Pans)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Dundee	0	0	1	0	1	0	0	0	0	0	2	0	3	2	1	1	1	0	1	0	1	0	0	0	11	3
WESTERN PORTS.																										
Ayr (including Girvan) and Irvine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Troon	0	0	0	0	0	0	2	0	0	0	2	0	0	0	1	0	3	0	1	0	1	0	0	0	10	0
Ardrossan	1	0	1	0	1	0	2	0	4	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	11	0
Clyde — Greenock	2	0	0	0	1	0	4	0	4	0	7	0	5	0	4	0	3	0	3	0	3	0	2	0	38	0
Clyde — Port Glasgow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Clyde — Glasgow	2	0	0	0	0	0	2	0	0	0	1	0	1	0	2	0	4	0	0	0	1	0	0	0	13	0
Clyde — Bowling Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total for Scotch District	6	0	3	0	4	0	13	0	12	0	15	0	12	2	9	1	15	0	5	0	6	0	3	0	103	3
General total for each class of voyage	103	2	95	0	108	0	127	0	150	3	114	5	147	3	110	5	183	6	146	1	107	0	116	1	1,506	26

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TABLE II.—Table showing the Number of Vessels which have sailed (S.) from the under-mentioned Ports with 500 tons of coal and upwards on Voyages across the Equator, and through the Suez Canal, during the year 1874, and the Number of Cases of Heating and Fire (H.) which have occurred out of these Sailings.

——	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total for each Port.	
EAST COAST DISTRICT.																										
Northern Ports.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.
Amble (Warkworth) and Seaham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tyne — Newcastle	14		22		16		7		16		13		27		15		30		17		14		19		210	
Tyne — North Shields	5	0	5	0	5	0	1	0	3	2	6	3	3	5	5	2	9	2	3	0	6	0	2	0	53	14
Tyne — South Shields	0		1		2		0		0		2		1		3		1		2		0		0		12	
Sunderland	4	0	8	0	8	0	3	0	7	0	4	0	10	0	7	1	14	0	12	0	12	0	1	0	90	1
Blyth	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0
West Hartlepool (including Hartlepool)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	1	0	5	0
Stockton and Middlesborough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yorkshire Ports.																										
Hull	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	6	0	1	1	1	0	1	0	12	1
Goole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grimsby	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
London	2	0	1	0	1	0	3	0	3	0	3	0	3	0	1	0	2	0	4	0	0	0	1	0	24	0
Total for East Coast District	27	0	37	0	34	0	14	0	29	2	29	3	45	5	34	3	63	2	40	1	33	0	25	0	410	16
SOUTH WALES DISTRICT.																										
Newport	3	0	2	0	4	0	5	0	3	0	4	0	6	0	3	0	7	0	6	0	4	0	5	0	52	0
Llanelly, including Carmarthen, Pembrey, Lougher, and Ferryside.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Cardiff, including Penarth	47	0	44	0	57	0	38	1	52	2	35	0	58	3	68	3	85	0	92	0	77	0	67	0	720	9
Swansea, including Neath, Port Talbot, and Porthcawl	3	0	8	0	8	0	5	0	6	0	9	0	8	1	13	0	7	0	8	1	11	0	11	0	97	2
Total for South Wales District	53	0	54	0	69	0	48	1	62	2	48	0	72	4	84	3	99	0	106	1	92	0	83	0	870	11
LIVERPOOL DISTRICT.																										
Liverpool	3	0	9	0	7	0	7	1	8	1	13	3	17	3	26	3	19	2	16	1	10	0	11	0	146	14
Birkenhead	11	0	10	0	12	0	17	0	15	0	17	1	14	1	16	0	21	1	26	1	24	0	28	0	211	4
Whitehaven	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total for Liverpool District	14	0	19	0	19	0	24	1	23	1	30	4	31	4	42	3	40	3	42	2	34	0	39	0	357	18
SCOTCH DISTRICT.																										
Eastern Ports.																										
Leith and Granton	0	0	1	0	3	0	1	0	2	0	0	0	1	0	2	0	1	1	1	0	0	0	2	0	14	1
Grangemouth, Borrowstouness, Inverkeithing, Charlestown, and St. David's.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alloa (including Kennet Pans)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dundee	0	0	1	0	0	0	3	1	1	0	2	1	1	0	0	0	1	0	1	0	0	0	0	0	10	2
Western Ports.																										
Ayr (including Girvan) and Irvine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ardrossan	0	0	0	0	1	0	0	0	2	0	0	0	1	0	2	0	2	0	1	0	0	0	0	0	9	0
Troon	0	0	1	0	2	0	1	0	0	0	2	0	1	0	1	0	2	0	0	0	1	0	0	0	11	0
Clyde — Greenock	0		3		1		3		3		3		5		4		8		10		2		6		48	
Clyde — Port Glasgow	0		0		0		0		0		1		1		0		0		1		0		0		3	
Clyde — Glasgow	3	0	3	0	0	0	3	0	6	1	1	1	3	4	3	0	5	0	3	0	7	0	4	0	41	6
Clyde — Bowling Bay	0		0		0		0		0		0		0		0		0		0		0		0		0	
Total for Scotch District	3	0	9	0	7	0	11	1	14	1	9	2	13	4	12	0	19	1	17	0	10	0	12	0	136	9
General Total for each Class of Voyage	97	0	119	0	129	0	97	3	128	6	116	9	161	17	172	9	221	6	205	4	169	0	159	0	1,773	54

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TABLE III.—Table showing the Number of Vessels which have sailed (S.) from the under-mentioned Ports with 500 Tons of Coal and upwards on Voyages across the Equator, and through the Suez Canal, during each Month of the Year 1875, and the Number of Cases of Heating and Fire (H.) which have occurred out of these Sailings.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total for each Port.	
EAST COAST DISTRICT.																										
Northern Ports.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.		S.	H.	S.	H.	S.	H.	S.	H.	S.	H.
Amble (Warkworth) and Seaham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Tyne — Newcastle	21		14		19		14		20		5		20		19		19		12		10		13		206	
Tyne — North Shields	5	0	5	0	3	0	3	0	3	0	2	1	3	1	1	1	2	1	1	0	2	0	3	0	33	4
Tyne — South Shields	0		1		0		2		0		23		0		0		0		0		0		0		6	
Sunderland	5	0	10	0	13	0	5	0	7	0	7	0	4	0	10	0	13	0	7	0	12	0	4	0	97	0
Blyth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Hartlepool (including Hartlepool)	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	2	0	6	0
Stockton and Middlesborough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yorkshire Ports.																										
Hull	1	0	3	0	1	0	1	0	1	0	1	0	0	0	5	0	2	0	2	2	4	0	2	0	23	2
Goole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grimsby	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	3	0	0	0	8	0
London	2	0	2	0	0	0	1	0	2	0	1	0	1	0	2	0	1	0	4	0	1	0	0	0	17	0
Total for East Coast District	35	0	35	0	37	0	26	0	33	0	40	1	30	1	39	1	37	1	28	2	32	0	24	0	396	6
SOUTH WALES DISTRICT.																										
Newport	2	0	2	0	0	0	2	0	2	0	3	0	11	0	3	0	3	0	3	0	3	0	3	0	37	0
Llanelly, including Carmarthen, Pembrey, Lougher, and Ferryside.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Cardiff, including Penarth	24	0	17	0	31	2	26	0	23	0	61	0	73	1	88	0	86	1	100	0	50	0	43	0	622	4
Swansea, including Neath, Port Talbot, and Porthcawl	8	0	4	0	6	0	3	0	12	0	6	0	1	1	8	0	7	2	7	0	9	0	5	0	71	3
Total for South Wales District	34	0	23	0	37	2	31	0	37	0	70	0	85	2	94	0	97	3	110	0	62	0	51	0	731	7
LIVERPOOL DISTRICT.																										
Liverpool	8	0	8	0	13	0	12	1	4	0	12	2	17	1	7	0	11	1	18	0	10	0	17	0	137	5
Birkenhead	15	0	19	0	15	0	12	0	14	0	19	1	21	0	6	0	17	1	23	0	17	0	20	0	198	2
Whitehaven	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total for Liverpool District	23	0	27	0	28	0	24	1	18	0	31	3	38	1	13	0	28	2	41	0	27	0	37	0	335	7
SCOTCH DISTRICT.																										
Eastern Ports.																										
Leith and Granton	1	0	0	0	0	0	2	0	0	0	5	0	0	0	0	0	2	0	0	0	0	0	2	0	12	0
Grangemouth, Borrowstouness, Inverkeithing, Charlestown, and St. David's.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alloa (including Kennet Pans)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dundee	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	6	0
Western Ports.																										
Ayr (including Girvan) and Irvine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ardrossan	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	1	0	9	0
Troon	0	0	0	0	3	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	6	0
Clyde — Greenock	4		2		2		3		6		11		6		2		10		7		5		1		59	
Clyde — Port Glasgow	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	2	2
Clyde — Glasgow	0		2		6		7		11		6		3		8		6		7		5		2		63	
Clyde — Bowling Bay	0		0		0		0		0		0		0		0		0		0		0		0		0	
Total for Scotch District	7	0	4	0	14	0	13	0	18	1	22	0	10	0	12	1	20	0	18	0	12	0	7	0	157	2
General total for each class of voyage	99	0	89	0	116	2	94	1	106	1	163	4	163	4	158	2	182	6	197	2	133	0	119	0	1,619	22

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TABLE IV.—Showing the Number of Vessels which have sailed (S.) from the under-mentioned Ports with 500 Tons of Coal or upwards for (1) the South Atlantic, including the Cape of Good Hope; (2) for the East Indies, including Australia, China, and Japan; and (3) for the West Coast of America, during the Years 1873, 1874, and 1875; and showing out of these Sailings the Number, as far as can be ascertained, of Heatings and Fires (H.) from Spontaneous Combustion.

	South Atlantic Voyages.						East Indian Voyages.						West Coast Voyages.						Total for each District.					
	1873.		1874.		1875		1873.		1874.		1875.		1873.		1874.		1875.		1873.		1874.		1875.	
EAST COAST DISTRICT.																								
NORTHERN PORTS.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.	S.	H.
Amble (Warkworth) and Seaham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tyne — Newcastle	57		76		87	0	109		92		90		18		42		29		184		210		206	
Tyne — North Shields	8	0	3	0	1	0	40	7	38	12	26	3	2	1	12	2	6	1	50	8	53	14	33	4
Tyne — South Shields	1		2		1	0	11		6		4		6		4		1		18		12		6	
Sunderland	15	0	12	0	23	0	65	0	53	0	64	0	0	0	25	1	10	0	80	0	90	1	97	0
Blythe	2	0	1	0	0	0	3	0	2	0	0	0	0	0	0	0	0	0	5	0	3	–	0	–
West Hartlepool (including Hartlepool)	0	0	0	0	2	0	4	0	3	0	1	0	1	0	2	0	3	0	5	0	5	–	6	–
Stockton and Middlesborough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–	0	–
YORKSHIRE PORTS.																								
Hull	6	3	7	0	9	0	3	1	4	1	6	0	1	0	1	0	8	2	10	4	12	1	23	2
Goole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–	0	–
Grimsby	0	0	0	0	0	0	2	0	1	0	8	0	0	0	0	0	0	0	2	0	1	–	8	–
LONDON	1	0	0	0	0	0	22	3	23	0	16	0	0	0	1	0	1	0	23	3	24	–	17	–
Total for East Coast District	90	3	101	0	123	0	259	11	222	13	215	3	28	1	87	3	58	3	377	15	410	16	396	6
SOUTH WALES DISTRICT.																								
Newport	31	0	28	0	20	0	16	0	15	0	18	0	5	1	9	0	4	0	52	1	52	0	37	–
Llanelly, including Carmarthen, Pembray, Lougher, and Ferryside	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	1	0	1	–
Cardiff, including Penarth	289	2	340	0	254	1	242	1	309	3	297	1	92	0	71	6	71	2	623	3	720	9	622	4
Swansea, including Neath, Port Talbot, and Porthcawl	12	0	13	0	1	0	4	0	2	0	1	0	71	2	82	2	69	3	87	2	97	2	71	3
Total for South Wales District	332	2	381	0	275	1	262	1	327	3	312	1	168	4	162	8	144	5	762	7	870	11	731	7
LIVERPOOL DISTRICT.																								
Liverpool	30	0	21	0	15	0	12	0	14	1	14	0	54	0	111	13	108	5	96	0	146	14	137	5
Birkenhead	23	0	17	0	23	0	104	0	152	3	142	2	41	1	42	1	33	0	168	1	211	4	198	2
Whitehaven	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
Total for Liverpool District	53	0	38	0	38	0	116	0	166	4	156	2	95	1	153	14	141	5	264	1	357	18	335	7
SCOTCH DISTRICT.																								
EASTERN PORTS.																								
Leith and Granton	14	0	9	1	7	0	0	0	0	0	2	0	4	0	5	0	3	0	18	–	14	1	12	–
Grangemouth, Borrowstouness, Inverkeithing, Charlestown, and St. David's.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–	0	0	0	–
Alloa (including Kennet Pans)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	–	0	0	0	–
Dundee	1	0	1	0	0	0	10	3	8	2	3	0	0	0	1	0	3	0	11	3	10	2	6	–
WESTERN PORTS.																								
Ayr (including Girvan) and Irvine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–	0	0	0	–
Ardrossan	1	0	6	0	0	0	2	0	0	0	2	0	8	0	3	0	7	0	11	–	9	0	9	–
Troon	7	0	11	0	4	0	2	0	0	0	1	0	1	0	0	0	1	0	10	–	11	0	6	–
Clyde — Greenock	18		16		25		14		26		21	1	6		6		13		38	–	48	–	59	1
Clyde — Port Glasgow	0	0	1	2	0	0	1	0	2	3	0	0	0	0	0	1	2	1	1	–	3	6	2	1
Clyde — Glasgow	4		10		21		5		13		10	0	4		18		32		13	–	41	–	63	–
Clyde — Bowling Bay	0		0		0		0		0		0	0	0		0		0		0	–	0	–	0	–
Total for Scotch District	46	0	54	3	57	0	34	3	49	5	39	1	23	0	33	1	61	1	103	3	136	9	157	2
General total for each class of voyage	521	5	574	3	493	1	671	15	764	25	722	7	314	6	435	26	404	14	1,506	26	1,773	54	1,619	22

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TABLE V.

SHOWING for each Month of 1873 what number of the Vessels which Sailed from Liverpool and from Birkenhead with 500 Tons of Coal and upwards on voyages across the Equator, and through the Suez Canal, had been loaded by Tip or by Hand.

The Casualties are printed between Parentheses.

1873.	South Atlantic.				East Indies.				West Coast of America.				Totals.			
	Tip.		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
January.																
Liverpool	0		0		1		0		5		6		6		6	
Birkenhead	1	1	0	0	1*	2	3	3	0	5	2	8	2	8	5	11
February.																
Liverpool	0		2		1		0		0		1		1		3	
Birkenhead	0	0	0	2	0	1	7	7	4	4	1	2	4	5	8	11
March.																
Liverpool	0		2		1		1		1		0		2		3	
Birkenhead	1	1	5	7	0	1	8	9	0	1	0	0	1	3	13	16
April.																
Liverpool	1		1		2		2		2		2		5		5	
Birkenhead	2	3	0	1	0	2	5	7	3	5	2	4	5	10	7	12
May.																
Liverpool	1		2		0		1		2		1		3		4	
Birkenhead	1	2	2	4	0	0	9	10	0	2	2	3	1	4	13	17
June.																
Liverpool	0		1		1		0		2		2		3		3	
Birkenhead	0	0	0	1	1	2	6	6	2	4	0	2	3	6	6	9
July.																
Liverpool	1		5		0		1		2		3		3		9	
Birkenhead	0	1	2	7	0	0	4	5	6	8	2	5	6	9	8	17
August.																
Liverpool	0		2		0		0		3		5		3		7	
Birkenhead	3	3	0	2	1	1	10	10	4	7	1	6	8	11	11	18
September.																
Liverpool	0		3		0		0		2		2		2		5	
Birkenhead	1	1	0	3	3	3	11	11	3	5	2	4	7	9	13	18
October.																
Liverpool	0		5		1		0		3		2		4		7	
Birkenhead	0	0	0	5	2	3	12	12	(1) 2	5	2	4	(1) 4	8	14	21
November.																
Liverpool	1		1		0		*0		2		1		3		2	
Birkenhead	1	2	0	1	2	2	8	8	0	2	2	3	3	6	10	12
December.																
Liverpool	0		2		0		0		2		3		2		5	
Birkenhead	1	1	3	5	4†	4	7	7	0	2	1	4	5	7	11	16
Totals:																
Liverpool	4		26		7		5		26		28		37		59	
Birkenhead	11	15	12	38	14	21	90	95	(1) 24	50	17	45	(1) 49	86	119	178

* 1 steamer through the Canal. † 2 steamers through the Canal,

TABLE VI.

SHOWING for each Month of 1874 what number of the Vessels which Sailed from Liverpool and from Birkenhead with 500 Tons of Coal and upwards on voyages across the Equator, and through the Suez Canal, had been Loaded by Tip or by Hand.

1874.	South Atlantic.				East Indies.				West Coast of America.				Totals.			
	Tip		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
January.																
Liverpool	2		0		1		0		0		0		3		0	
Birkenhead	0	2	0	0	*5	6	5	5	0	0	1	1	5	8	6	6
February.																
Liverpool	3		1		0		0		3		2		6		3	
Birkenhead	0	3	4	5	0	0	4	4	2	5	0	2	2	8	8	11
March.																
Liverpool	0		2		0		1		1		3		1		6	
Birkenhead	1	1	2	4	1	1	8	9	0	1	0	3	2	3	10	16
April.																
Liverpool	0		0		0		0		(1) 1		6		(1) 1		6	
Birkenhead	1	1	0	0	5	5	9	9	1	2	1	7	7	8	10	16
May.																
Liverpool	0		3		0		1		(1) 1		3		(1) 1		7	
Birkenhead	1	1	0	3	3	3	9	10	1	2	1	4	5	6	10	17
June.																
Liverpool	0		0		(1) 1		1		(2) 7		4		(3) 8		5	
Birkenhead	0	0	0	0	0	1	15	16	1	8	(1) 1	5	1	9	(1) 16	21
July.																
Liverpool	1		0		0		1		(3) 10		5		(3) 11		6	
Birkenhead	0	1	0	0	(1) 2	2	8	9	3	13	1	6	(1) 5	16	9	15
Forward:																
Liverpool	6		6		2		4		(7) 23		23		(8) 31		33	
Birkenhead	3	9	6	12	(2) 16	18	58	62	8	31	(1) 5	28	(1) 27	58	(1) 69	102

* 5 steamers through the Canal.

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TABLE VI.—*continued.*

1874.	South Atlantic.				East Indies.				West Coast of America.				Totals.			
	Tip.		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
Forward :																
Liverpool -	6		6		2		4		(7) 23		23		(8) 31		33	
Birkenhead -	3	9	6	12	(2)16	18	58	62	8	31	(1) 5	28	(1) 27	58	(1) 69	102
August.																
Liverpool -	0		2		0		3		(3) 10		11		(3) 10		16	
Birkenhead -	1	1	0	2	1	1	12	15	1	11	1	12	3	13	13	29
September.																
Liverpool -	1		1		1		1		(2) 10		5		(2) 12		7	
Birkenhead -	0	1	0	1	(1) 7	8	12	13	1	11	1	6	(1) 8	20	13	20
October.																
Liverpool -	0		3		1		1		6		(1) 5		7		(1) 9	
Birkenhead -	2	2	0	3	(1) 8	9	11	12	1	7	4	9	(1) 11	18	15	24
November.																
Liverpool -	1		1		0		0		6		2		7		3	
Birkenhead -	0	1	0	1	6	6	7	7	5	11	6	8	11	18	13	1
December.																
Liverpool -	0		0		0		1		7		3		7		4	
Birkenhead -	2	2	3	3	3	3	11	12	5	12	4	7	10	17	18	22
Totals :																
Liverpool -	8		13		(1) 4		10		(12) 62		(1) 49		(13) 74		(1) 72	
Birkenhead -	8	16	9	22	(3) 41	45	111	121	21	83	(1) 21	70	(3) 70	144	(1) 141	213

TABLE VII.

SHOWING for each month of 1875 what number of the Vessels which sailed from Liverpool and from Birkenhead with 500 tons of Coal and upwards on Voyages across the Equator, and through the Suez Canal, had been loaded by Tip or by Hand.

1875.	South Atlantic.				East Indies.				West Coast of America.				Totals.			
	Tip.		Hand.		Tip.		Hand.		Tip.		Hand.		Tip.		Hand.	
January.																
Liverpool - -	0		2		0		0		5		1		5		3	
Birkenhead -	0	0	4	6	1	1	9	9	1	6	0	1	2	7	13	16
February.																
Liverpool - -	0		1		1		0		4		2		5		3	
Birkenhead -	0	0	0	1	2	3	14	14	1	5	2	4	3	8	16	19
March.																
Liverpool - -	1		0		2		0		6		4		9		4	
Birkenhead -	1	2	1	1	1	3	8	8	0	6	4	8	2	11	13	17
April.																
Liverpool - -	0		0		0		0		(1) 6		6		(1) 6		6	
Birkenhead -	1	1	2	2	0	0	6	6	0	6	3	9	1	7	11	17
May.																
Liverpool - -	0		1		1		0		0		2		1		3	
Birkenhead -	0	0	3	4	0	1	4	4	2	2	5	7	2	3	12	15
June.																
Liverpool - -	2		0		1		2		(2) 6		1		(2) 9		3	
Birkenhead -	0	2	1	1	1	2	(1) 13	15	1	7	3	4	2	11	(1) 17	20
July.																
Liverpool - -	0		0		1		0		12		(1) 4		13		(1) 4	
Birkenhead -	0	0	1	1	2	3	15	15	1	13	2	6	3	16	18	22
August.																
Liverpool - -	1		0		1		0		2		3		4		3	
Birkenhead -	0	1	0	0	0	1	5	5	1	3	0	3	1	5	5	8
September.																
Liverpool - -	1		1		1		0		(1) 4		4		(1) 6		5	
Birkenhead -	0	1	1	2	(1) 4	5	11	11	1	5	0	4	(1) 5	11	12	17
October.																
Liverpool - -	1		1		0		1		12		3		13		5	
Birkenhead -	1	2	0	1	2	2	17	18	2	14	1	4	5	18	18	23
November.																
Liverpool - -	1		0		2		0		4		3		7		3	
Birkenhead -	3	4	1	1	2	4	10	10	0	4	1	4	5	12	12	15
December.																
Liverpool - -	0		2		0		1		7		7		7		10	
Birkenhead -	0	0	3	5	1	1	14	15	1	8	1	8	2	9	18	28
Totals :																
Liverpool -	7		8		10		4		(4) 68		(1) 40		(4) 85		(1) 52	
Birkenhead -	6	13	17	25	(1) 16	26	(1) 126	130	11	79	22	62	(1) 33	118	(1) 165	217

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CLASSIFIED LIST of VESSELS which have been reported to have their Cargoes of Coal Heated or Fired from Spontaneous Combustion, and have sailed from the United Kingdom for Voyages South of the Equator, during the year 1875.

District. Port of Shipment. Name of Vessel.	Nationality.	When built, and how classed.	Iron or wood.	Net Register Tonnage.	Depth of Hold.	Number of Decks and No. laid.	Quantity and Description of Coal.	Name of Coal Agent or Shipper.	Kind of Ventilation, if any.	Date of Sailing.	Destination.	Date of Casualty or when the signs of Heating were first discovered.	Days out.	Where the Casualty occurred.	Nature of Casualty.	Remarks.
EAST COAST PORTS.																
TYNE.																
Helen Morris	Am.	1868 3/3	W.	1,285	23·9	2 l.	1,653, Cowpen Hartley	J. Fothergill	Ventilated	7 June	San Francisco	24 Nov.	About 140	29° 14′ S. 87° W.	Burnt	Abandoned 28th November.
William Poolman	Dutch	1866 3/3	I.	1,546	27·3	3 ll.	1,611, Bowers W. Hartley	—	Ventilated	14 June	Java	24 Sept.	102	11° S. 9° E.	Ditto	Abandoned 27th September.
P.V.W.S. (Utrecht?)	Dutch	1868 A1	C.	1,873	23·8	—	——	—	—	27 Aug.	Samarang	3 Nov.	68	42° S. 46° E.	Fire	Telegram from Batavia, Dec. 1st, states fire in cargo on voyage of "Utrecht."
Aberaman	Brit.	1875 100A.	I.	1,090	21·9	—	1,625, Cowpen Hartley	J. Fothergill	Masts and bits ventilated.	16 Sept.	Bombay	During discharge.	About 120	Bombay.	Heating	New ship. Arrived 11th January, and during discharge coal found in highly heated condition and almost on point of ignition.
HULL.																
Le Baron	Brit.	1870 3/3	W.	907	19	2 ll.	— West Riding Hartley	Pope and Pearson	Ventilated	18 Oct.	Valparaiso	6 Feb.	111	Off Cape Horn.	Burnt	—
Patmos	Am.	1859 5/6	W.	738	21·6	2 2l.	— Featherstone Main	—	—	18 Oct.	Ditto	30 Jan.	104	59° S. 77° W.	Ditto	Abandoned 31st January.
SOUTH WALES PORTS.																
CARDIFF.																
Independencia	It.	1872	W.	616	—	—	877, Rhondda Coal	J. R. Davies	Not ventilated	17 Mar.	Valparaiso	p. 2 June	Prev. 77	Near Falkland Islands.	Heated	Arrived 2nd June and sailed again August 11th.
Quattro Fratelli	It.	1869	W.	550	19·3	2 ll.	750, Aber Rhondda bit. coal, and 200 Coed Cae coal.	Ditto and Coed Cae Co.	—	9 Mar.	Ditto	About 20 June.	About 103	Valparaiso.	Fire	Discovered shortly after arrival.
Domenico Galliano	It.	1865	W.	537	18	2 2l.	869, Mostly bituminous coal, (11 kinds of coal.)	—	—	6 July	Singapore	17 Oct.	103	28° S. 90° E.	Fire	Cargo on fire on voyage.
Landsborough	Brit.	1853	W.	1,066	23·8	—	1,567, Dynas smokeless coal, and 19 tons No. 3 Rhondda	—	—	25 Sept.	Rio Janeiro	About 23 Nov.	About 59	Rio Janeiro	Heated	Fire confined to the Rhondda coal, and found out on arrival.
SWANSEA.																
Powhattan	Brit.	1866 A1	W.	400	17·1	—	580, ——	T. Davies & Co.	—	25 July	Valparaiso	—	Prev. 75	—	Heated	Put into Falkland prev. 8th October with cargo heated. Had thrown some cargo overboard.
PORTHCAWL.																
Fanny	Brit.	1863 A1	W.	397	17·0	2 ll.	— Aber Thro' and Thro'	E. David	—	15 Sept.	Ditto	Prev. 27 Dec.	Prev. 103	—	—	Put in Coquimbo 27th December; cargo on fire.
Mabel	Brit.	1873 A1	W.	454	—	2 ll.	— Ditto	Ditto	—	17 Sept.	Ditto	—	—	—	—	—
LIVERPOOL DISTRICT.																
LIVERPOOL.																
Angelo Antonio	It.	1870	W.	595	—	2 ll.	900, Orrell Steam Coal	Jothn. Blundell	—	30 April	Callao	2 July	63	600 miles off St. Catherines, S. America.	Burnt	Loaded at tip; run ashore 14th July near St. Catherines, South America.
Frankfurt Hall	Brit.	1869 A1	I.	728	19·0	—	804, Ditto	Orrell Coal Co.*	—	3 June	Valparaiso	29 Sept.	118	Valparaiso	Fire	Arrived 21st; fire discovered 29th and again on 4th October.
Clevedon	Brit.	1868 A1	I.	698	18·8	—	1,047, Ditto (Tawd Vale)	F. A. Widdows & Co.	Cowls over coal	25 June	Ditto	21 Sept.	88	40° S. 77° W.	Burnt	Loaded at tip.
River Boyne	Brit.	1867 A1	I.	499	17·3	—	766, Ditto	Orrell Coal Co.	—	15 July	Ditto	12 Oct.	88	57° S. 72° W.	Fire	Loaded by basket; beached at Cape Horn.
San Rafael	Brit.	1862	W.	955	22	2 2l.	1,312, of Tawd Vale and Crow Orchard Coal.	Ditto	Ventilated	18 Sept.	Ditto	4 Jan.	108	53° S. 76° W.	Burnt	Loaded under the tip.
BIRKENHEAD.																
Arracana	Brit.	1862	W.	1,192	23·9	2 ll.	1,756, Coed Talon	H. N. Hughes	Ventilated	19 June	Bombay	22 Oct.	126	13° N. 73° E.	Burnt	Abandoned 24th October.
Theresa	Brit.	1857 A.1	W.	705	20·6	2 ll.	920, Chell Colliery, Staffordshire	French & Co.	Ventilated	25 Sept.	Rangoon	6 Dec.	82	34° S. 17 E.	Burnt	Abandoned at Sea.
CLYDE DISTRICT.																
GREENOCK.																
Beucleuch	Brit.	1875 100 A.	I.	1,350	22	—	1,781, Watson's Hartley	John Watson	Ventilated	22 Aug.	Bombay	22 Nov,	92	16° N. 68° 24′ E.	Fire	New ship; first voyage; arrived 5th December. Cargo found on fire 22nd. Scuttled to allow water to rise to 10 feet.
Antelope	Brit.	1873 3/3	W.	1,306	23	2 2l.	1,273, Ditto	Ditto	Not ventilated but not full.	13 May	San Francisco	4 Oct.	144	San Francisco	Fire	Arrived San Francisco 22nd Sept.; took fire while discharging.

* Formerly W. H. Brancker.

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(*h.*) Paper by Mr. A. P. Sandeman, Surveyor under the Marine Department of the Board of Trade.

Coal Cargoes.

The liability to spontaneous combustion on board coal-laden ships, and the fearful consequences which have lately been reported, appear, and reasonably so, to threaten a serious restriction to our foreign export coal trade, if not to entirely suspend it. We may with truth say a week now seldom passes without its sad tale of loss in many instances of life, as well as of valuable ships, and all attributable to this cause.

The question has been asked in the House whether these startling facts have been noticed, and in reply (through the President of the Board of Trade) the public are informed that a Royal Commission will possibly be appointed to inquire into the subject of "coal cargoes." But "in the meantime" the evil will continue, and this, when a remedy may at once be applied, appears to be a hard case. Ships coal-laden continue to leave our ports daily, whose cargoes are loaded in the same manner, no change whatever occurring to remedy the evil, or indeed any action shown "whatever," as to uneasiness or a sense of any increasing cause for alarm beyond that taken by *underwriters*, who have raised their rates of premium—a clear demonstration of the increased risk.

It may, and doubtless is, presumed by many that nothing can be done beyond what is being done to remedy or guard against serious evil, or it may be that they believe extra special care is being taken, or possibly they altogether ignore the practicability of doing anything that would further protect their vessels from the risk of being burnt and the lives of the crew from the perils which must necessarily attend such a calamity, and hence the evil continues and is likely to do so. I believe all shipowners are interested in this matter, but all are not agreed as to the causes which contribute to spontaneous combustion of coal cargoes. One class of shipowner will show constant interest by adopting all "ordinary precautions," a platform is laid, and vertical shafts are introduced at each hatch, and where no permanent 'tween deck is laid, fore and aft trunks are laid on or under the lower beams, with thwartship connexions to the vertical hatchway shafts. "This is all in the right direction," but it is inefficient, and requires to be extended more thoroughly through the cargo to be effective. In other instances the kelson *only* is ventilated; this is a matter of economy and is seldom of much use, as it is not frequently well or effectively done. The vertical hatch shafts are led into this, and if the line of kelson remains clear the circulation or current of air is to a limited extent maintained. In other cases again, and not a few, little or no interest is manifested "*whatever*" in ventilating, and no effort is made to prevent the coals heating or to carry off any combustible gas that may generate.

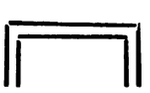
However carefully the ventilation may be arranged, even presuming it was sufficient to keep the cargo cool, so little interest is taken in the matter that it frequently gets damaged and is rendered useless before the loading is completed. I could instance cases where large vessels taking nearly 2,000 tons have been ventilated with all "ordinary" care, but that done no further interest was apparently manifested, the master may not have joined, the overlooker is merely on board occasionally, and the mate, as a rule, seldom knows anything about it. The coal trimmers are left in possession of the hold to load the vessel as they please, and they care little about the ventilators. One vessel in particular as a "case in point" came under my observation. She belonged to a Liverpool firm who are reputed for their care in ventilating; her kelson was ventilated, she had well-made ventilators in each hatch, and longitudinal shafts intermediate and in the wings which had connexion with the hatchway shafts, and appeared to be in order; as an underwriter's surveyor I had in ordinary course to report on the vessel, and I found the whole of the three hatch ventillators had got damaged and were filled with coal within a few feet of the top, and the coal had broken down the kelson ventilation both at the fore and after ends. I met one of the owners and the overlooker on board who were ignorant of the damage, and the mate could give no explanation.

It is very different with rice cargoes, for the preservation of which a most careful system of ventilation is adopted, which under ordinary circumstances in proportion to the cargo is about five times greater than what it is in coal-laden vessels. In the carriage of grain a loss may be attributed to the owner, or if the cargo sweats the reputation of the ship will suffer, and hence every care is taken to keep a cargo very liable to heat from doing so, master and officers are prompted and encouraged to superintend the laying of the ventilation, and every care is adopted to protect the owner from loss. But with coal cargoes, where life is frequently jeopardised, it appears to be almost completely the reverse; in most cases the coal is put on board heavily charged with moisture and liable to heat if confined under hatches. Ventilation may or may not be arranged, but as a rule no one seems to be employed to look after it, and to see that it is not damaged; the cargo is not unfrequently hurried in from the Birkenhead tips or high-level quays, and all is left to stevedores, and, the cargo in, the hatches are put on, and in many cases if combustion is the result it is little to be wondered at.

If coal-laden ships were placed on a par with rice-laden ships in the matter of ventilation, and the same observant care taken whilst loading, I am persuaded we should hear no more of these calamitous events. The system of ventilation would merely have to be more in detail, and if it is admitted that *perfect ventilation* will keep coal from heating, as it does a rice cargo, then detail becomes a matter of easy arrangement.

The platform, as in rice-laden ships, is most essential, as it affords a free circulation of air underneath. I would step large vertical shafts on the middle line in each of the hatchways to rise above the coamings, to be protected and secured so as to be open in all weathers. Other vertical shafts should be placed in proportion to the size of the vessel intermediate from the middle line in towards the wings spaced about 25 feet apart, all the vertical shafts to pass through the platform.

Section showing the vertical shafts and the intermediate fore and aft shafts leading into them; the fore and aft shafts are open underneath.



Fore and aft shafts should be placed in connexion with the intermediate and middle shafts on the lower deck beams and about half-way from lower deck to platform, and also fore and aft shafts in the wings on both sides; the whole of these longitudinal shafts to penetrate the cargo from end to end.

Transverse shafts should also be fitted to connect the fore and after with each other and with the vertical hatch shafts "always open," thus there would always be a current of fresh air passing through the cargo. Deck ventilators might also be fitted forward and aft to supply fresh and carry off heated air.

So ventilated there would be a column equal to a square foot of fresh air passing through every square block of 40 tons, and so ventilated it would be most improbable that coal, however wet or liable to sweat when confined, could do so so as to endanger spontaneous combustion. The cost would of course be much greater than it is at present constructed, but I apprehend it would not greatly exceed 1*s.* 6*d* per ton on her cargo, and when value is allowed for the material when sold at the port of destination it would be considerably less.

This system of ventilation has been advocated by the underwriters for years past, and their surveyors have been *specially instructed* to recommend its adoption; and the sooner it is insisted upon and made compulsory the sooner will we cease to hear of the sad and revolting catastrophes which have lately resulted from spontaneous combustion with coal cargoes on foreign voyages.

In meantime I would submit that until some remedy is adopted so that coal cargoes can be carried to distant ports without danger of fire, vessels so laden should be required to carry properly fitted "life-boats," found with mast and sail, and having provision tanks, water breakers, and boat compasses ready for use in case of need; and considering the painful evidence which we have had of the danger to which such cargoes expose the vessel, and consequently the crew, they appear to be special cases almost calling for supervision under section 12 of the Merchant Shipping Amendment Act of 1873, as defective in equipment (boats) for their intended voyage.

(Signed) A. P. Sandeman.

Liverpool, 3rd March 1875.

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(*i.*) Paper by Mr. Jeula. (See his Evidence, page 141, Q. 12.)

Losses of Coal-laden Vessels.

The only way of really ascertaining the facts as to losses of ships and lives which have already occurred is to tabulate the number and dates of clearances for, say, five years, stating the vessel, her flag, size, crew all told, the description and quantity of coal shipped in her, and her voyage, with any other available particulars; if this were done, reliable information would soon be obtained, but a comparison between the number of voyages entered upon and the number of casualties occurring is absolutely necessary to a correct estimate of results.

I venture respectfully to suggest that the following heads of inquiry would be of importance for future guidance:—

A. The special character of different coal ordinarily shipped, on long or short voyages, as to elements of combustion, hardness or softness, and probable crumbling and breaking up, or the contrary?

B. The results of shipping it wet or dry, large or small, and by barrows or from a tip?

C. The influence of recent strikes upon the out-put, and the results of more immediate transfer of coal from the mine to the ship consequent thereon?

D. Whether, when laden in large or small vessels, it is more or less dangerous, and whether explosions are more frequent in small vessels and spontaneous combustion in large vessels?

E. Whether usually ventilated or not; whether different customs as to ventilation prevail at different coal ports, consequent upon special kinds of coal being shipped therefrom, or otherwise; and, if ventilated, whether at the top over the coal only, or by vertical, with or without horizontal, ventilators, near the keelson, or higher up in the body of the cargo, or by any or all of these means, or by any others, and if so, whether by wooden, metal, or earthenware ventilators; and the results of the various systems?

F. What means are generally employed for putting out a fire in a coal-laden vessel when it occurs? Could steam be used with advantage (especially in steam vessels) in preference to water, and if so, could arrangements be made without very much difficulty or expense for applying it in case of need?

G. The relation of the vessel's registered tonnage and her crew to the quantity of coal shipped in her; and whether this relation varies in consequence of the different character of the coal, or with the different ports from or to which she sails, or with different seasons of the year?

H. Whether unguarded lights, or safety lamps, are generally used on board coal-laden vessels, and if any special rules are adopted?

Henry Jeula,
Lloyd's, E.C.

20th April 1875.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

ROYAL COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

SPONTANEOUS COMBUSTION OF COAL IN SHIPS.

Tuesday, 20th April 1875.

PRESENT:

THE RIGHT HONOURABLE HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

Sir GEORGE ELLIOT, Bart., M.P.
HENRY HUSSEY VIVIAN, Esq., M.P.
FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
JOHN PERCY, Esq., M.D., F.R.S.
WILLIAM YOUNG, Esq.

J. M. CARMICHAEL, Esq., Secretary.

Captain HENRY M. HOZIER, Secretary of Lloyd's; HENRY JEULA Esq., Underwriting Member of Lloyd's, examined.

Captain H. M. Hozier and H. Julia, Esq.

20 April 1875.

1. (*Chairman to Capt. Hozier.*) You are secretary to Lloyd's?—I am.

2. (*To Mr. Jeula.*) What position do you hold at Lloyd's?—I am an underwriting member of Lloyd's, and was honorary secretary to the Statistical Committee of Lloyd's at its commencement.

3. You have taken a great interest in the statistics of this question before us?—Yes, in this question with others.

4. (*To Capt. Hozier.*) Have you any information to lay before the Commission in connection with the subject of their inquiry?—I put in a list of coal-laden vessels posted at Lloyd's as lost or damaged through fire in 1874,* showing the results to the vessel and cargo. I also put in a list of missing coal-laden vessels (*handing in the same.*)†

5. Can you give us at present any further information about any of those ships?—I would rather do that later. I may mention that in the year 1872 only 14 coal-laden vessels were posted as missing, all being sailing vessels. In 1873 45 were posted as missing, 41 being sailing vessels, and four steam. In 1874 the number was 35, 31 being sailing vessels, and four being steam vessels. In the first quarter of 1875 the number was 10, seven being sailing, and three being steam vessels.

6. Could you give a similar list for any number of years previous to 1872?—We could furnish such a list for any number of years back.

7. The materials are available for carrying it back 10 years?—Yes.

8. The commissioners would be glad to be furnished with a similar list for 10 years back if you could give it them?—I will have such a list prepared.

9. (*Mr. Vivian.*) Could you give the proportion which those ships bear to the total number of ships laden with coal?—I will furnish that.

10. Could you also compare the number of coal-laden ships lost or damaged or missing in the years for which you give the return with the total number of ships that have sailed laden with other goods which have been also reported lost or damaged or missing, because many may have been lost, not by the spontaneous combustion of coals but by ordinary casualties of the sea?—I will furnish such a comparison.

11. One question which would arise would be whether the ships which load with coal are in the main of a lower class than other vessels; whether some portion of the excess of missing coal laden ships, if there is any such excess, is due to the class of ships; will you therefore give the classes of the vessels, and specify whether they were iron or wooden vessels?—I will give those particulars.

12. (*Chairman to Mr. Jeula.*) Have you any suggestions to make to the Commission?—I hand in a paper containing a few suggestions as to some directions in which I think inquiry would be useful (*handing it in*).‡

13. (*To Capt. Hozier.*) Have you anything else to put before the Commission at present?—I hand in a letter from the Coal Inspector of the Peninsular and Oriental Company to the Committee of Lloyd's (*handing in the same*).§

The witnesses withdrew.

NOTE.—The form and scope of the returns alluded to in questions 6 to 11 were subsequently modified, in consideration of the serious expense which their preparation would have incurred, but the returns which were prepared by Lloyds for the Commission will be found at pages 101 and 108.

* *See* Appendix, page 104.
† *See* Appendix, page 108.
‡ *See* Appendix, page 140.
§ *See* Captain Steinson's letter quoted by Mr. Price, page 177.

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T. H. Farrer, Esq.

20 April 1875.

THOMAS HENRY FARRER, Esq., examined.

14. (*Chairman.*) You are permanent secretary to the Board of Trade?—I am.

15. This Commission, I think, originates from the Board of Trade, though it is in form issued by the Home Office?—That is so.

16. Will you state to the Commission the circumstances under which you recommended its issue?—There had been a considerable number of cases in which coal-laden ships were lost by fire, in which the Board of Trade had ordered inquiries under the provisions of the Merchant Shipping Acts, and they took some pains in some of the later inquiries to get scientific evidence, and to go as fully into the question as they could. They found, however, that the tribunal before whom those inquiries were conducted, that is to say a magistrate and two nautical assessors, was scarcely competent to investigate the scientific and complicated questions that arose, and they therefore thought it was useless to order more inquiries which did not produce any great elucidation of the subject. Lloyd's Committee thereupon, I will not say remonstrated, but desired that there should be further inquiry, and we had some correspondence with them upon the subject, and also with the Salvage Association of which Mr. Harper is secretary. The result of that correspondence was that the Board of Trade ascertained that those bodies desired not so much further statutory inquiries under the Merchant Shipping Act, as a careful investigation such as could only be conducted by a body specially appointed for the purpose, and in the end this Commission was appointed.

17. Can you put that correspondence before the Commission?—I will put in the whole of the correspondence.*

18. Can you also furnish us with the minutes of the evidence taken in inquiries in special cases?—I put in the minutes of the whole proceedings containing the evidence on the two inquiries which throw most light upon the subject, viz., the inquiries into the cases of the Herbert Graham and the Minnie Graham, and I put in a list of the cases in which we have had inquiries. I also hand in copies of the abstract of the Wreck Register in which the results of those inquiries are stated generally (*handing them in*). If the Commissioners think it it desirable to have before them the evidence taken on the inquiries in the other cases, I can produce it.

19. (*Dr. Percy.*) I think it would be desirable to have the proceeding on the other cases?—I will send the minutes of the proceedings in the whole of those cases.†

20. (*Chairman.*) Besides holding those inquiries have you had any correspondence with the officers at the ports on the subject?—No, I think we have had no correspondence that throws any light upon this question.

21. So that the inquiries, and the correspondence with Lloyd's, and with the Salvage Association, tell the whole tale as far as the Board of Trade can give it?—They do.

22. You have held 12 inquiries into the causes of the burning of coal-laden vessels since 1868?—Yes.

23. Is there any special reason for selecting the two cases of the "Herbert Graham" and the "Minnie Graham"?—I took out those two because in looking through them it appeared to me that the subject was gone into more fully in those cases than in any others, and some scientific evidence was taken in those cases.

24. Have you anything else to put before the Commission at the present moment?—Only two returns, one of which has been presented to Parliament, and the other is on the point of being presented (*handing them in*).

25. That is the whole of the information which Parliament has about the burning of coal-laden vessels at sea?—Yes. I could of course give from our wreck returns the proportion of losses of coal-laden vessels to the losses of vessels laden with other cargoes. I could get a return of that sort made out; but without a great many more details than we could give, I doubt whether it would be of much value.

26. Lloyd's would probably be able to give such a return as completely as it could be given?—Yes. From some experience in trying to get at results from statistics of that kind I am not very sanguine about getting very important results from them.

27. (*Mr. Vivian.*) The Board of Trade take cognizance only of English ships?—Only of British ships.

28. (*Sir G. Elliot.*) You, generally speaking, have stated that 12 inquiries have taken place into losses by fire of coal-laden vessels; what proportion do you suppose they represent of the total number which have taken fire within the period?—I could tell you what proportion they bore to the total number that we know to have taken fire. I can tell you nothing about missing vessels.

29. Have you any impression what proportion it would be?—Not at this moment.

30. The ships which come under your jurisdiction are called British vessels; what proportion would the casualties we are speaking of in British vessels bear to similar casualties in the whole of the vessels carrying coal sailing from British ports?—I could not tell you that.

The witness withdrew.

Adjourned.

Tuesday, 1st June 1875.

PRESENT:

THE RIGHT HON. HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

SIR GEORGE ELLIOT, Bart, M.P.	JOHN FENWICK, Esq.
HENRY HUSSEY VIVIAN, Esq., M.P.	JOHN FERGUSON, Esq.
FREDK. AUGUSTUS ABEL, Esq., F.R.S.	CHARLES ICELY, Esq.
RICHARD CORY, Esq.	JOHN PERCY, Esq., M.D., F.R.S.
GEORGE DUNCAN, Esq.	WILLIAM YOUNG, Esq.

J. M. CARMICHAEL, Esq., Secretary.

Mr. R. C. Rundell.

1 June 1875.

Mr. R. COOPER RUNDELL examined.

31. (*Chairman.*) Will you tell the Commissioners what position you occupy?—I am assistant to the secretary to the Underwriters' Association of Liverpool.

32. I believe you have given a good deal of attention to the question which is specially referred to this Commission?—I have given it attention for some five or six months past, particularly to a point which is of special interest to underwriters, namely, the increased marine risk; and it was with the view to discover the probable cause of the spontaneous combustion of coal in ships, and to afford some means of estimating the increased risk, that I prepared some statistics which I have recently presented in the form of a report to the Underwriters' Association. The committee have desired me to state that they will be

* *See* Appendix I., page 1.

† *See* Appendix II., page 4.

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pleased to present the Commissioners with a copy of the report when it is finally printed; it is already in the hands of the printer.

33. That report will be issued to your own body, and published for private circulation?—Yes.

34. I think you have collected some statistics with reference to three-fourths of the year 1873, and you are able to compare those with the corresponding period of the year 1874?—Yes.*

35. What was your particular object in taking three-fourths of the year, and not the whole year?—At the time when I commenced this investigation sufficient time had not elapsed for the completion of the voyages for the year; it was with the view of having all the voyages completed that I took the nine months instead of the 12 months.

36. However, what you have is a complete analysis of the results in coal-laden ships, sailing with above a certain quantity of coal, and crossing the Equator, during similar periods, in the two years?—Yes. I have taken vessels carrying 500 tons of coal and upwards. The reason for selecting the first nine months of each year was, as already stated, to allow time to ascertain the result of each sailing, and the reason of selecting the two elements of carrying over 500 tons and crossing the Equator was because a preliminary investigation showed that the heating and fires chiefly occur in vessels with cargoes of 500 tons and upwards, and that a considerable time usually elapses before the signs of heating are discovered.

37. Will you give us the results of the statistics you have collected with regard to those vessels from this country which have crossed the Equator carrying 500 tons or more of coal during those two periods, namely, the three first quarters of 1873 and the three first quarters of 1874?—An examination of the facts collected show, first, that in the cases selected for comparison no fires occurred before the 37th day after leaving port, while in one case there was no evidence of fire before the 190th day. The greater number of fires have, however, occurred about the 60th day. Secondly, that the fires have not been confined to one kind of coal, but have occurred in most, if not all, of the varieties which are usually exported. In fact, the inquiries which have been made support the opinion that no kind of ordinary coal containing hydrogen has entire immunity from spontaneous combustion. Thirdly, we find that fires occur in the cargoes whether the coal be ventilated or not, whether loaded in summer or winter, by tip or by basket. Among the instances are vessels ventilated by shafts through the coal, both horizontally and vertically, by vertical shafts only, and by means of platforms and side linings which allow a circulation of air under the cargo from one end of the ship to the other. Some of the cargoes also are especially named as having been shipped in fine weather. It is probable, however, that there is a certain amount of moisture always present in all coal.

38. Those are the general conclusions which you have come to; will you give us the statistics upon which those conclusions are based. In the first place, how many vessels as to which you have information sailed with cargoes of above 500 tons on voyages crossing the Equator during the nine months in each year?—In the first period, that is to say, the first nine months of 1873, 1,133 vessels sailed. Out of those there were 23 casualties from spontaneous combustion, or about two per cent. In the second period, that is to say, in 1874, there were 1,240 sailings, out of which there were 50 casualties, or about four per cent.

39. Those are casualties connected with fire?—Yes.

40. Do those casualties include missing vessels?—No. I have a separate list of missing vessels out of those particular sailings. In the nine months of 1873 out of the 1,133 coal-laden vessels which sailed from the United Kingdom (not necessarily British ships) there were five missing vessels, and in 1874 out of the 1,240 there were seven missing vessels.

41. That is to say, in 1873 there were 23 disasters known to have arisen from fire, and five missing ships?—Yes.

42. And in 1874 there were 50 casualties known to have arisen from fire and seven missing ships?—Yes; several of those were ships that probably foundered at sea. I have examined each case on its merits, and in the case of some of them wreckage was picked up, or there was some sign from which it might be presumed that the vessel had not been burnt.

43. You have limited your inquiries to vessels that crossed the Equator?—Yes.

44. (*Mr. Young.*) You say they are "selected" cases; what do you mean by selected cases?—I have selected those ships carrying 500 tons and upwards, and I have also selected those crossing the Equator.

45. Do the 1,133 and the 1,240 comprise every ship carrying above 500 tons of coal that crossed the equator?—Yes, from the United Kingdom.

46. (*Chairman.*) Then you have classified those sailings according to the districts from which the coal was shipped?—Yes. I have adopted a classification of the coal ports already in use, viz., East coast ports for north country and Yorkshire coal, South Wales ports for South Wales coal, Liverpool and Birkenhead for Lancashire and North Wales coals respectively, and Scotch ports (both east and west) for Scotch coal. The facts brought out in this classification and comparison are shewn in the following figures: Out of 268 sailings from the east coast ports during the first period, there were 13 casualties, or 4·85 per cent., while during the second period, out of 312 sailings, there were 15 casualties or 4·81 per cent. This shows that although in each year there is a high percentage of casualties in coal from the east coast ports the percentage has somewhat decreased in the second period, that is as to the east coast. There is one fact that may be interesting with respect to the east coast shipments. It is by the addition of the Yorkshire and London statistics that the east coast returns show a decrease in the percentage of casualties. If these be taken from the returns of the east coast ports, the number of casualties for the first period will be about four per cent., while for the second period it will be about five per cent., thus showing an increase of 25 per cent.

47. On what?—On the casualties in the cases of vessels from the northern ports; that is to say, by taking away the South Yorkshire and London shipments.

48. (*Sir George Elliot.*) You mean the coals shipped at Grimsby have not given such a result as regards spontaneous combustion as the coals shipped at the northern ports?—The Yorkshire ports have shown a decrease, while the northern ports have shown a slight increase in the percentage of cases of heating.

49. (*Dr. Percy.*) Do the figures you are giving comprise cases of heating only, or do they include cases of explosion also?—They apply to cases of spontaneous combustion alone. I have not taken account of any case where I had reason to suppose that it was a case of explosion.

50. (*Chairman.*) Will you now pass to shipments from another district?—I will pass to the South Wales district. Out of 587 sailings from South Wales ports during the first period, there were seven casualties, or about 1·19 per cent.; while during the second period out of 589 sailings, there were 10 casualties or 1·7 per cent. This shows that in each period there has been but a small percentage of casualties in coal from the South Wales ports, but that the percentage has increased nearly 50 per cent. in the second period. Next taking the Liverpool district. From the Mersey there are two very distinct classes of coal shipped, namely, the North Wales coal and the Lancashire coal. Lancashire coal is shipped on the Liverpool side of the Mersey, and the North Wales coal on the Birkenhead side. Taking the shipments at Birkenhead there were 120 sailings from Birkenhead during the first period, and out of those there were no casualties. During the second period out of 133 sailings, there were three

* Mr. Cooper Rundell's Statistics, revised and extended by him for the information of the Commission, will be found in the Appendix, at page 127.

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Mr. R. C. Rundell.

1 June 1875.

casualties or 2·27 per cent. From Liverpool there were 69 sailings during the first period, and out of these there were no casualties, while during the second period, out of 109 sailings, there were 13 casualties or 11·9 per cent. Passing to the Scotch ports (east and west), out of 89 sailings from Scotch ports (east and west), during the first period there were three casualties, or 3·37 per cent.; while, during the second period, out of 97 sailings, there were nine casualties or 9·28 per cent. This shows that while the percentage of casualties in the coal from the Scotch ports is high in each period it has increased in the second period nearly threefold.

51. Can you give the Commission not only the class of coal or the seam from which the most dangerous coal seems to come as shown by the aggregate losses but the percentage on the shipments?—No. Underwriters would be very pleased to be able to get that information; it has been only in a few cases that I have been able to obtain it. From Liverpool there were 13 cases of heating, seven of which occurred in coals supplied from one firm and four of which occurred in coals supplied by another firm. A glance at the names of the different kinds of coal which have heated will show that while they are generally subject to this danger of spontaneous combustion, there are two or three which are conspicuous from the frequency with which they recur. It must not, however, be hastily concluded that the latter are of a more dangerous kind as the shipments may also be more numerous. I may mention that, although some Lancashire coal has been burning, there are some very distinct varieties of Lancashire coal. There is the cannel coal, which is considered a very safe coal.

52. (*Mr. Vivian.*) I presume there have been no cases of spontaneous combustion in the case of cannel coal?—I have not heard of any at all, it is looked upon by the Liverpool underwriters as a very safe class of coal. They have also in esteem several other kinds of coal that go from Liverpool which I could mention. The best Orrell coal bears a high character.

53. You cannot classify the Lancashire coals in any way so as to distinguish between those that are combustible spontaneously and those that are not?—No, but certain kinds, such as Crow Orchard coal, are thought to be more liable to spontaneous combustion, and Liverpool underwriters who discriminate between the different kinds of coal do not care to insure them.

54. You cannot distinguish as between dry coal and bituminous coal, that is to say, coking coal and non-coking coal?—No, I do not find that Liverpool underwriters go into that question, though bituminous coals are avoided by some.

55. That is to say, coking coals?—Those that cake. In west coast voyages there is the largest increase in the number of casualties in the second period as compared with those in the first period and this increase proceeds chiefly from coal shipped at Liverpool and from South Wales ports. In the Liverpool sailings to the west coast the greater number of cases of heating were in cargoes of Lancashire coal, while in the South Wales sailings, but with one exception, all were in cargoes of bituminous coal shipped, I believe, for smelting purposes.

56. (*Chairman.*) You have given us an analysis of casualties with reference to the districts from which the coal was shipped, can you tell us out of so many ships carrying north country coal, for instance, what percentage of casualties there would be, and out of so many ships carrying Welsh coal what percentage of casualties there would be?—Yes. Taking the different districts, the east coast ports, for instance, I could tell you, out of the number of casualities, what coal in particular cases was shipped by one shipper and what by another shipper. I could give the names of the vessels.

57. Could you analyse the return and give those statistics?—Yes; I will furnish that to the Commission, but I could not give the percentage of casualities on the shipments of any class of coal. I can only say in how many cases heating occurred with Scotch coal or Lancashire coal, and so on.

58. With reference to the class of shipping in which these casualties occur, I think you have some information to give the Commission?—Yes. In the first period in which the casualties which I have mentioned occurred, the average tonnage of the vessels was less than in the second period. Only one third of the vessels in the first period are over 1,000 tons, while in the second more than half of them are above that tonnage. In the second period there are eight vessels above 1,500 tons, and only two in the first period. To estimate how far the greater size of the ships explains the larger number of cases in the second period it would be necessary to ascertain if the average tonnage of the vessels which sailed during the second period is much greater than in the first period. Those particulars I have not had an opportunity of getting for the whole of the districts, but I have the particulars for Liverpool.

59. Have you distinguished between sailing ships and steamers?—I have taken steamers when they have taken a cargo of coals, but not when they have taken coals for merely bunker use.

60. Have you distinguished in the 1,133 and the 1,240 how many were steamers and how many were sailing ships?—No, but I can do so hereafter, so far as Liverpool is concerned. Nearly the whole of those vessels whose cargoes heated were first-class vessels, vessels holding a high class in the register. I may mention that from Liverpool for the eight months to the 31st of August 1874 I find that the number of sailings of iron vessels to wooden ones bore the proportion of about one to three; of the whole number of sailings about a fourth were iron vessels, but taking voyages to the west coast of America the iron vessels were about 75 per cent. of the whole number of sailings. A much greater proportion of iron vessels seem to have gone to the west coast of America. Among the vessels before referred to whose cargoes heated, the proportion of iron to wood is greater in the second period than it is in the first. Seven out of the 24 iron vessels were built during the second period. In connexion with the character of the ships to which casualty occurred, the depth of hold is a point worth noting as influencing the breakage of the coal. The depth of hold in the second period averages about 16 inches more than in the first period. But the mere depth of hold without taking into account the number of laid decks will only imperfectly indicate the mass of the cargo. The "Glory of the Seas" has by far the greatest depth of hold but she has three laid decks, so that the coal could be turned over when necessary. The captain also reports that his being able to turn over the coal and expose it to the cooling effect of the air, enabled him to bring his ship to San Francisco.

61. With regard to the number of days that elapsed in the cases of the casualties to which you have referred between the period of the sailing of the ship and the first indication of heating, have you any information to give us?—In a table which I have here, the 73 cases to which I have already referred are arranged to show the number of days that elapsed between the sailing of the ship and the first indication of heating. The earliest case occurred when the vessel was between 10 and 20 days out, in the latest the fire occurred nearly 200 days after sailing, and when the vessel had been in port about nine days. Indeed, the number of cases which occur after the arrival of the vessel in port shows that extra care should be taken at this time. It has been suggested that the heating is caused by the access of air when the hatches are taken off, and the discharge commenced, but in the case of the "Merom" the fire was in the fore compartment where the discharge had not begun. In another case, the "Respigadera," I am informed that until her arrival in San Francisco there was no sign of heat in the coal.

62. Can you give us the number of cases in which casualties occurred after leaving port within the first month, and the number in which they occurred in

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the second month, and so on?—Yes. In 1873, I have found no cases until after the fortieth day, between 40 and 50 days out, there was one case; between 50 and 60 days out, two cases; between 60 and 70 days out, three cases; between 70 and 80 days out, three cases; between 80 and 90 days out, three cases; between 90 and 100 days out, one case; between 100 and 110 days out, four cases; between 110 and 120 days out, two cases; between 120 and 130 days out, one case; between 130 and 140, one case; none between 140 and 190 days out; one case between 190 and 200 days, making 22 cases; and then there is the case of the Arracan, where I have not been able to get the time.

63. That exhausts the 23 cases of the first period?—Yes.

64. Can you give the corresponding particulars for 1874?—The first case occurred between 10 and 20 days out; the next case between 30 and 40 days out; the next nine cases between 50 and 60 days; the next six cases between 60 and 70 days; the next two cases between the 70th and 80th day; the next four cases between the 80th and 90th day; the next six between the 90th and 100th days; the next six between the 100th and 110th day; then there were two cases between the 110th and 120th day; one case between the 120th and 130th day; three cases between the 130th and 140th day; one case between the 140th and 150th day; and four cases between the 150th and 160th day, making 46 cases. Then there were five cases in which I have not been able to obtain the exact period. The coal carried in those cases being: Tyne coal by the "Unione," Bower's West Hartley by the "Maassluis," Powell Duffryn steam coal by the "Lady Louisa," and Brancker's Orrell coal by the "Victorine." I may remark that this table affords no indication that spontaneous combustion is more quickly developed in coal from one district than in that from another, and with different kinds of coal, the greatest number of heatings occur about the 60th day after leaving port.

65. Have you any statistics bearing on the question of temperature?—The tables I have here show very decidedly that the summer sailings are the most dangerous, that is to say, those for the months of June, July, and August. In 1873 the largest percentage of cases occurs in the August sailings, in 1874 it occurs in those for July. If the different districts be compared in this way, the following is the result: from the east coast district in 1873 the greatest number of casualties occurred in the sailings in June, and in 1874 in July. From the South Wales district the greatest number of casualties in 1873 occurred in June, and in 1874 in July. In the Liverpool district in 1873, there were no fires, in 1874 the greatest number of casualties occurred in June. In the Scotch district in 1873 the greatest number were in August, and in 1874, July.

66. These are the dates of sailing?—Yes.

67. Have you any percentages as to the dates of the casualties?—The greatest number of casualties have occurred in September and October.

68. Must not your statement be qualified by this, that you do not give any statistics as to the ships which sailed in the last quarter of the year?—Yes.

69. So that the comparison is only between the sailings of the first nine months of the year?—Yes. My statistics refer to these periods, but I have a table which shows graphically the period of the year over which a much greater number of voyages in which casualty has occurred have extended, and that table shows that these voyages have occurred during the hot period of the year. That table includes 128 cases. It embraces a period from 1868 to 1874, and about a half of the whole number of cases occurred in 1874. I will furnish the Commissioners with that table. There are two points worth noting while considering the effect of temperature, that is when and where the first signs of heating were discovered. In selecting those voyages only which extend beyond the Equator there is necessarily a high temperature for a large portion of each voyage. It will be found in each year that the greatest number of heatings occurs in September and October. As regards geographical position in the first period, out of 23 cases 11 occurred in the Atlantic, and 12 to the east of the Cape of Good Hope. In the second period out of 50 cases, 30 occurred in the Atlantic, 14 to the east of the Cape of Good Hope, and six on the West Coast of America. If we compare these with the total number of selected vessels which sailed into the three geographical divisions thus indicated, to the South Atlantic division must be added the sailings east of the Cape of Good Hope and west of Cape Horn (excluding the Indian sailings by way of the canal). These selected sailings into the South Atlantic are about 1,129 for the first and 1,237 for the second period. Comparing with these numbers the respective Atlantic casualties, the percentages are for 1873, 0·97 per cent.; for 1874 2·43 per cent., an increase of more than 150 per cent. If the sailings for the Indian Ocean are compared in the same way the resulting percentages are 2·41 and 2·56 respectively, or an increase of only about six per cent. for the second period. For the West Coast, in the first period, there were no casualties out of 235 sailings, while, in the second period, out of 283 sailings there were six, or 2·11 per cent. This shows the relative increase for each of the three divisions.

70. That is with reference to the voyage?—Not as regards whether it was a West Coast voyage or an East India voyage, but showing the division where the casualties have occurred, and the percentage is on the number of vessels which sailed from the United Kingdom *into* that division.

71. Have you also statistics with reference to the voyage?—Yes; by comparing for each period the selected sailings for the three divisions with the casualties respectively belonging to these sailings, we obtain the following results:—For South Atlantic voyages in the first period there are four heatings in 399 voyages, or about one per cent.; in the second period there are three heatings in 410 voyages, or about three-quarters per cent., or a slight decrease in the danger on these voyages. For Indian voyages in the first period there are 14 heatings in 499 voyages, or 2·81 per cent.; in the second period there are 23 heatings on 546 voyages, or 4·21 per cent., an increase of about 50 per cent. For West Coast voyages in the first period there are five heatings in 235 voyages, or 2·13 per cent.; in the second period there are 24 heatings on 284 voyages or 8·44 per cent., an increase of nearly 300 per cent. This shows a remarkably large increase in the number of cases of spontaneous combustion in coal shipped to the West Coast ports.

72. Have you any explanation to give of that?—I have separated them into districts to show where the coal came from, and the details are as follows: From the east coast ports in the first period there was one casualty out of 21 sailings, or about five per cent.; in the second period there were three out of 62 sailings, or about five per cent., the same as before. From the South Wales ports in the first period there were four casualties out of 122 sailings, or 3·28 per cent.; in the second period there were seven out of 101 sailings, or an increase of more than 100 per cent. From the Mersey in the first period there were no casualties out of about 71 sailings: in the second period there were 13 out of 99 sailings, or over 13 per cent. In the second period there were 12 cases out of about 82 sailings from the Liverpool side of the Mersey, while there was only one out of 17 sailings from the Birkenhead side. From Scotch ports there were no casualties out of 21 sailings in the first period, and in the second period there was one out of 22 sailings.

73. These all refer to voyages to the West Coast?—These all refer to voyages to the West Coast. The great increase, therefore, in the percentage of casualties in West Coast voyages occurs in coal shipped at Liverpool and the South Wales ports. I may repeat what I said before that 12 out of the 13 cases of heating in these sailings from the Mersey were in cargoes of

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Lancashire coal, while those in South Wales cargoes were generally in bituminous coal.

74. Having given us those particulars as to the voyage, as to the class of coal, as to the place of shipment, and as to the month of the year in which the sailings and the casualties have taken place, have you any statistics to give as to the mode of shipment?—In Liverpool coals are shipped both by hand and by tip. On the Birkenhead side the shipments are by shoots, and on the Liverpool side by a crane that carries the wagon over the vessel; the truck is lowered and then tipped, the coal falling down the whole depth of the hold. In some cases the crane also takes boxes from a truck. There are three boxes generally on a truck, and those boxes are lowered by means of the crane into the hold so that the coal need not get so broken when it is unloaded from the box as when it is tipped from the wagon. The hand loading is by basket and by barrow.

75. Have you any statistics as to the apparent effect of different kinds of loading?—No, but comparing the loading by crane and the loading by hand I have the following: Of the vessels which sailed from the Mersey in the nine months, January to September 1873, 65 out of 189 were loaded by tip, or 34 per cent. of the whole. In the same period for 1874 88 out of 242, or about 36 per cent., showing a very slight increase in the percentage of shipments by tip during the second period.

76. How does that bear upon the result as to casualties?—I have given here the total number shipped by tip, the shipment by tip on the Liverpool side, and the shipments by tip on the Birkenhead side; if we separate the shipments by tip on the Liverpool side from the shipments by tip on the Birkenhead side, the Liverpool side shows an increase in the number of shipments by tip in 1874 of over 75 per cent. which is a significant fact when we remember that the great increase of fires has been in the Lancashire coal shipped on the Liverpool side. The conclusion, therefore, that I would draw is that the shipment of coal by tip breaks the coal very much and increases the danger.

77. (*Mr. Vivian.*) As to the Birkenhead shipments can you tell us what description of coal it was, whether it was bituminous coal or not?—The fires have occurred in North Wales steam coal in each case. There were only three cases; the first was a North Wales steam coal, the particular colliery not named; then there was main coal from the Tryddyn Colliery, Coed-Tallon, and a mixed cargo of Westminster, Brymbo, and Oak pits; that was in the 1874 period. There were no cases of heating in cargoes of coal shipped from Liverpool or Birkenhead in the 1873 period.

78. Can you give us the description of coal shipped from the South Wales ports?—There were ten cases of heating in the 1874 period, one in each of the following: Powel Duffryn steam coal, Insoles' No. 3 Rhondda, Insoles' Merthyr steam coal, Hood's Merthyr steam coal, and six in No. 3 Rhondda coal, which I believe is a smelting coal.

79. Were those to the West Coast of America?—These shipments from the South Wales ports were not entirely to the West Coast; there were three to the East, one to Shanghai, and two to Singapore. In the 1873 period there were seven cases of heating from the South Wales ports as follows: two in Rhondda bituminous coal, one in steam coal (colliery not named), two in Broad Oak bituminous coal, one in Through-and-through bituminous coal, and one in Aber smelting coal.

80. Where was that shipped?—At Porthcawl.

81. Where was the Through-and-through coal shipped?—From Newport.

82. Does that exhaust the whole of the South Wales coal?—Yes, I have given you the whole of the names.

83. Can you give us the same particulars with regard to the Scotch ports?—Beginning with the 1873 period when three cases of casualities occurred, the descriptions of coal were as follows: Wishaw Ell coal supposed to be from the Larkhall district, Townhill steam coal from Fife, and Ell coal from the Wishaw district. In 1874 there were nine cases, viz.: Steam coal, Ell coal, splint coal, collieries not known, Russell's main coal. Then there was a cargo containing four different kinds of coal, all splint coal from these collieries, Woodside field, Hell field, Lougler field, and Skellyton field. Then Watson's Hartley, Auldton Ell coal, Auldton steam coal, and Splint steam coal, colliery not known.

84. Those were shipped from what port?—Some from the Clyde and some from Dundee; the Auldton Ell coal and the Auldton steam coal were shipped from Dundee, and one splint steam coal from Leith, all the other coals being shipped from the Clyde. That was in 1874, and in 1873 the two shipments of Wishaw Ell coal and the Townhill steam coal were shipped from Dundee.

85. Can you give us the same particulars with regard to ports on the east coast of England?—In 1873 out of 13 cases, there was a shipment of each of the following: Harton Wallsend house coal, Davison's West Hartley steam coal, Howard's West Hartley steam coal, Cowpen Hartley steam coal, Featherstone's main second-class large steam coal, West Yorkshire, Featherstone's West Riding steam coal, Yorkshire Hartley steam coal, and three shipments of which I do not know the particulars. Then shipped from London there was Newcastle West Hartley coal in two cases. In the year 1874 there were fifteen cases, viz.: Of Cowpen Hartley, three, of Howard's West Hartley, one cargo of a mixture of both of these, one of Bower's West Hartley, one of Carr's Hartley, one of Ravensworth West Hartley, another of coal described as West Hartley main steam, one of coal Bedside West Hartley, one of Davison's West Hartley steam coal, and one of Hastings Hartley coal; one cargo I have been unable to trace, and this makes the whole for 1874.

86. (*Mr. Cory.*) You have given the number of casualties and the different kinds of coal, can you give also the number of shipments of different kinds of coal?—No. I have only had the number of shipments in 1873 and 1874 from two collieries sent to me.

87. The number of casualties does not very clearly show the comparative liability of coal to spontaneous combustion?—No, unless you know the number of shipments of a particular kind of coal you can scarcely form an idea whether it was a dangerous coal, it might be that that coal was more generally shipped.

88. (*Mr. Fenwick.*) Do I rightly understand you to say that more accidents occurred in iron vessels laden with coals than in wooden vessels?—In the second period there was a greater proportion of iron vessels in the casualties, but it is difficult to say whether it was on account of there being more iron vessels, there was a greater proportion of casualties in the second period. It is noteworthy that out of the casualties in 1874 a large proportion occurred in new ships.

89. Do you give any particulars as regards coal shipped in wooden vessels as compared with coal shipped in iron vessels?—Only with respect to those vessels to which casualty has occurred. In a tabular form I have the particulars of each vessel as well as the kind of coal, on one page the particulars of each vessel and her cargo, giving the names of the vessels, the nationality, the year when built, the class, whether iron or wood, net registered tonnage, depth of hold, number of decks and if laid, tons of coal, description of coal, name of fitters or shippers, and kind of ventilation. Then on the other side are particulars of the voyage and the casualties, giving the date of sailing, the destination, date of the casualty, or when signs of heating were first discovered, the number of days the vessels were out, where the casualty occurred, the nature of the casualty, and some few remarks.

90. (*Mr. Icely.*) Have you any accurate information with regard to the mode of ventilation adopted in the cases of those vessels in which casualties occurred?—Yes, for a number of cases.

91. Have you had any sketches made of the ventilation adopted?—In some cases I have had sketches

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made, and I should be pleased to put them in. It is a very difficult matter to say whether a vessel is sufficiently ventilated or not. She may have left the United Kingdom with good arrangements for ventilation, or been prepared for a certain amount of ventilation, and that ventilation may have been crushed in by carelessness in loading. The underwriters surveyors at Liverpool have recommended a certain system of ventilation, and they would be able to give the Commission very detailed information as to the mode they recommend. These surveyors go round the docks and give information amongst other things to the underwriters respecting the mode of ventilation adopted.

92. (*Mr. Young.*) You said if I remember rightly that of the whole number of sailings in the two years one third of the vessels were of iron and two-thirds of wood?—I spoke merely of sailings from Liverpool for the second period when I said that the number of iron vessels which sailed was a third of the number of wooden.

93. You did not tell us how many iron vessels were burnt or encountered disaster?—Eight on the first period and sixteen in the second. Four out of the sixteen Liverpool casualties were in iron vessels.

94. You said that the sailings in June, July, and August were the most dangerous?—We have had the greatest number of casualties in the sailings for those months.

95. You have not gone into a comparison of the number of sailings in those months with the number of casualties?—Yes, I have the date but have not given the percentages.

96. You have taken into account that there are a greater number of vessels actually sailing in those months as well as a greater number of casualties?—I have a table showing for each month of the two periods the number of sailings, and the number of casualties which have been reported out of those sailings.

97. From that you would come to the conclusion that June, July, and August are the most dangerous months?—Yes, the greatest per centage of casualties have occurred in the sailings for those months.

98. I understand that that conclusion arises from a comparison of the whole number of vessels that have sailed, with the whole number of casualties?—Yes, after that I have been able to ascertain.

99. (*Chairman.*) Crossing the Equator?—Yes.

100. (*Mr. Young.*) Throughout your statistics, do I understand that you have as far as possible got the particulars of every vessel that has sailed as well as of every vessel that has had a casualty?—Yes, as far as possible; the per-centage of casualties on sailings of course is the information that is desired. The sailings from most of the coal ports have been obtained from Brown's monthly export lists. In these lists, when more than one vessel has sailed during the month from either port for the same voyage, only the aggregate of their cargoes is given and not the number of tons of cargo belonging to each vessel. In the tables, each vessel is included if the aggregate tonnage of the cargo gives an average of more than 500 tons, and unless the average amounts to 500 tons the vessels are excluded. The tables are thus subject to any slight error which this may occasion.

101. (*Mr. Abel.*) Do your statistics include as casualties only those cases in which important damages have been recorded?—Any case of heating that I have heard of I have included as a casualty.

102. Any case of heating that has come to your notice as having given rise to damage?—There has been scarcely any case of heating that I have had an opportunity of examining, but that there has been some damage more or less; in fact some pecuniary less

103. May we look upon these cases of heating, which are classed as casualties, as giving something like a complete return of the cases of heating and fire that have occurred?—As far as I have been able to ascertain, I think all the published cases, and, I do not know what proportion, but I should expect a large proportion, of those cases that have not been published, perhaps more particularly as far as Liverpool is concerned.

104. (*Chairman.*) Would the cases which you have included in your figures be those in which a claim has been made upon the underwriters?—No, I have not been governed by that; some are cases in which a great amount of heating in the coal has been observed, and where I am unaware of any claim having been made.

105. (*Mr. Abel.*) You have included casualties where there was heating and fire and you have included also cases of heating without fire which have given rise to damage?—Yes, cases where jettison has resulted, where a man has been so alarmed about the heating that he has jettisoned the cargo. I have the details of each case of damage, and extracts from the masters' protests in a great number of cases giving particulars as to what efforts were used by the captain to extinguish the fire or to prevent the heating of the coal, showing that some captains showed great promptness and energy in preventing the extension of the evil.

106. I suppose you have not any data in your statistics which give the relation between the cases of casualties and the price of coal at the time of shipment?—No; where there is a readier market for coal you find that there is then an incentive to send coal for shipment that would not otherwise be sent. I have here some remarks from our agent at Marseilles that rather bears upon that point. In the latter part of the year 1874 there were a great number of casualties in the shipment of lignite from Marseilles for the Mediterranean ports and the agent's remarks in connexion with this was, "That increased demand has "has induced sellers to ship coals immediately after "their arrival from the mines, that is, with a certain "amount of dampness," showing that if they had not had this increased demand the coal would have probably been left at the coal pits some time before shipment. Inquiry was made of our agent with a view to discover if there were any transhipments of English coal from Marseilles, whether these fires had been in English coal. As far as he could ascertain they have been entirely confined to coal from the south of France.

107. I gather that you establish a decided relation between the breaking up of the coal and the frequency of the casualties in the coal shipped?—The breakage increases greatly the surface; for instance, if coal is tipped and much broken, the surface is greatly increased and there is a greater amount of decomposition going on in a limited space.

108. As a fact your statistics show that where the coal was either shipped by tipping or was "through and through" coal, coal containing a considerable proportion of slack, the number of cases of heating was increased?—I think that would be the deduction to be drawn from the statistics I have here, that the smaller the coal the more frequent the casualties.

109. (*Mr. Ferguson.*) As regards the 1,240 sailings in 1874 and the 1,133 sailings in 1873, have you taken any notice of other casualties that happened to those ships other than spontaneous combustion of coal?—No, but there have been cases of stranding.

110. You do not take those casualties into account in your statistics?—No, I have only taken missing vessels; I have, however, noted that in coal laden vessels on these voyages casualties, otherwise than from heating, are rare.

111. Of several vessels missing during that time it might be fair to conclude that some of those vessels might be lost from other causes than spontaneous combustion of coal?—Yes, in the cases I have here of missing ships I have endeavoured to form some conclusion as to whether they were lost by perils of the sea apart from fire, or from fire.

112. (*Mr. Duncan.*) Have you taken any notice whether the coals were single or double screened?—When I have had any information given me as to that point, I have taken note of it, but I have not asked

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for it specially; if I have had it, it has been given me gratuitously without its being asked for.

113. There is nothing in your statistics which would show whether or not coals double-screened would be less likely to take fire than coals single-screened?—No.

114. You would consider that when coals were carried by the crane over the hatchway and allowed to drop into the hold a greater quantity of small coal would be put on board than if the coal were put on board by barrows?—Yes, the coal would be liable to break more. Some coals are very friable. In "Stevens on Stowage" it is stated that in South Wales it is the practice to dig out a quantity of small coal from the hatch after the vessel has completed her loading, and to replace it by larger coal, showing that there is a feeling that danger may arise from too large a surface of small coal.

115. If they handle coals as I have seen them handle them in Liverpool in the case of the Peninsular and Oriental ships, where the coals are put into barrows, which barrows are lowered into the hold and there emptied, the coal is prevented from becoming broken?—This Company is very particular I believe about the shipping of its coal, and a special agent is appointed to inspect the shipping of the coal, not so much with a view to prevent fire as to prevent the coal becoming broken.

116. Have you been able to make any distinction between ships loaded in that way and ships loaded in the ordinary way by dropping the coals in from the tip?—Yes, and I have a return given me by Mr. Hughes of Liverpool, showing the number of vessels in which he has shipped North Wales coal by hand, showing that they have all arrived safely.

117. Your papers when put before the Commission would give information that would indicate that where coal is shipped in this way by barrow, the coal is not broken so much, the effect of that being to lessen the danger?—Yes.

118. I suppose you are aware that there is a considerable difference between the construction of the new ships and those constructed formerly, that difference having a tendency to affect their ventilation, that is to say, that the stringer plates are brought home to the shell of the ship in place of being attached to the frames as before. Whereas formerly there used to be an opening, now the stringer plate is secured by the angle iron to the shell of the ship and therefore to that extent the amount of space for ventilation is diminished?—The two periods that I have selected being only 1873 and 1874, I do not know that there would be that difference, between 1873 and 1874 in the style of building vessels.

119. You stated that there were a great number of new ships in 1874; the mode of construction to which I have referred of bringing home the stringer plates to the shell of the ship is a mode of construction that has been introduced within the last few years?—Anything that would tend to shut up the coal would naturally conduce to the danger of combustion.

120. That is one of the things that might have some effect in causing coal carried in new iron vessels to burn more readily than in the case of old vessels?—Probably. There is another point with regard to new vessels. It has been stated to me that when a shipowner has a new ship and he wants to load her with coal he asks the builder on what day she will be ready—the builder is always ready to name a day, and replies, "You may depend on having the vessel ready by such a day;" the owner says, "Well if so I will order the coals round." The shipbuilder declares that the vessel will be quite ready by that time and the owner orders the coals. Instead of being ready by that time the vessel may be days and weeks before she is quite ready, and the coal is all the while lying in the trucks exposed to bad weather, and I heard of one case in which coal brought down in that way and kept waiting for the vessel was exposed to bad weather so that the small coal became quite "pasty;" that was the term used.

121. (*Mr. Vivian.*) Did that coal fire?—It went merely from one of the east coast ports to London. I made inquiry about it, but could not find that it heated; it was a short voyage.

122. (*Mr. Duncan.*) You have stated that the coals appear to fire most readily that are shipped in the driest months of the year?—Dampness being one of the elements in spontaneous combustion I made inquiries to see how far the period in 1874 may have been damper than the period in 1873, and I found this to be the result. Taking in each year July, August, and September, when most of the coal cargoes affected by fire were shipped, there appears to have been no appreciable difference in the amount of rainfall in North and South Wales during these two periods, while in Lancashire, and Yorkshire, Northumberland, and Scotland those months were decidedly drier in 1874 than in 1873.

123. So that according to that it would seem that exposing them in the waggons does not do them any harm?—Not for these periods, so far as rainfall is concerned, but the coal may have been worked damper in 1874 That is another point; the surface seams in Lancashire (in this I am only speaking from hearsay) are damper than the deeper seams, but I have not heard that they were more worked in 1874 than in 1873. With regard to the coal from the seams in Lancashire I heard that some old seams that had been out of use for some time were reworked in 1874.

124. And those workings were all the time standing full of water?—I have no information upon that point.

125. You would not infer that there would be more coals brought in June, July, and August than in other months of the year?—No, not as a rule. In 1873 more vessels sailed in the previous three months.

126. (*Chairman.*) May the Commission take it as the upshot of your evidence that the casualties from spontaneous combustion of coal afloat are on the increase?—There is a great increase in 1874. As regards a comparison between 1873 and 1872, I could not give the result, as to the per-centage of casualties on voyages, but only approximately from a table I have here as to the number of casualties; I think I mentioned before that the number of casualties from 1868 up to the end of 1873 were 65, while the number in 1874 alone there were 64 cases, showing that for seven years we have the same number as in 1874.

127. From the knowledge which you have derived from your connexion with the Underwriters' Association of Liverpool, would you say generally that casualties were on the increase?—No, I should say not; there have been scares; as far back as 1867 there was a great deal of talk about spontaneous combustion of coal, and underwriters gave some particular attention to it, but since that I think premiums, so far as I have been able to judge (I have only limited experience in that matter), have not increased till last year.

128. During a series of years, up till last year, premiums were pretty steady?—As far as I know.

129. In this year they have risen?—They have risen from 25 to 75 per cent.

130. So far as the figures you have produced may be relied on, they have risen with justice; they are in consonance with the actual results?—Yes, but when the underwriters hear of a great number of fires occurring they are unable to tell, without going into a calculation of this kind, what the per-centage would be on the sailings, so as to estimate the risk, and therefore each one is left to himself to form an idea what would be a safe premium.

131. The per-centage on the sailings of 1874 is very much higher than the per-centage on the sailings of 1873?—100 per cent.

132. That is understood and acted on by the underwriters?—Yes.

133. They have not yet got before them those details which you have been working out, still the general results are tolerably well known?—I do not know what effect those statistics may have in altering

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the rates of premium. I do not know that they will have any effect, but each underwriter has been forming his opinion during this period, and I understand that generally the rates have somewhat declined of late; they consider that coals are safer now than they were in 1874.

134. Looking at the fact that for a good many years before 1873, so far as you can judge, there was no seriously increased per-centage of casualty, and that that per-centage seems to have suddenly increased in 1873 and 1874 and is now going down again, does not it look as if the proportion of casualties had a good deal to do with the increased demand and to the consequent want of care in the selection of coal?—Yes, I think that is a very natural deduction to make.

135. So far as you can judge, the casualties are not so much the result of carelessness on board, or in the appliances of the ship, as of want care in the selection of the coal and an absence of proper precautions in the shipment of the coal?—The information I have obtained appears to lead step by step to the conclusion that the increased number of casualties from spontaneous combustion proceeds from the condition in which the coal is shipped, and the coals shipped in 1874 were most probably not so free from pyrites and small coal as in the case of the coals shipped in the preceding years.

136. The very large increase in the demand for coal, compared with the supply in 1874, would account for coal being shipped that would be liable to take fire?—The coal agents found a market for the inferior coal, they were able to sell and get rid of.

137. Have you considered at all whether there is any connection between the increased amount of casualty, and the increased want of control over the men who are concerned in handling the coal?—No, I have only gone into the labour question as far as this, that for the last two years there has been a great increase in the cost of labour, and consequently there has been an inducement to curtail, as far as possible, all labour beyond that required to get and deliver the coal. The Coal Mines Regulation Act which came into force on January 1st, 1873, has also made one source of cheap labour less available. By this Act children are not allowed to work at the mine, except under certain restrictions, which have had the effect of gradually removing a great many of those who were formerly employed in cleaning and selecting the coal, and the remainder of the children, I am told, have thus been able to secure an increase in their wages of nearly 100 per cent. And then with regard to demand, there has also been a great demand for coal and a ready sale has been found for inferior and unclean sorts which would not formerly have been marketable.

138. That again is an element on shore and not afloat?—Yes.

139. Have you considered whether this also may not be an element, the diminished control over the men in the collieries, the men sending up coal which they ought not to send up and ought to throw aside?—I have been told this, that formerly men were fined for sending up bad coal, but that they are not fined for doing so now. The pitmen, it is stated, would have been fined for sending up so much bad stuff, and the stony and metallic part of the coal which did come up would be carefully separated at the pit's mouth. Now, the coal agent, in order to meet the demand, appears to accept anything passed to him.

140. So, summing it up, you, whose special function it is more to observe what happens afloat than what happens ashore, and who would be the first to mark if there was anything serious going wrong afloat, do not attribute either to the construction of the ships or to the management of the coal ships, or to the selection of the coal ships, the increased proportion of casualties, but you rather attribute it to what occurs before the coal is shipped?—Yes, greatly. There may be some other causes that help to make the increase larger, but I think the great cause for the increase arises from the condition of the coal before it goes on board.

141. A question was put to you as to the construction of coal ships, and you said on one point the more modern construction may lead to greater danger than before, by its interference with the ventilation?—I was not aware of the fact of my own knowledge, till Mr. Duncan mentioned it, but I think that would bear on the ventilation of the cargo.

142. Do you think that the class of ship that is being employed for carrying coal on these voyages is a worse class or a better class than it used to be?—I have not very great experience in the matter, but I should fancy that other freights being lower a better class of vessel is employed in the shipment of coal on long voyages than formerly.

143. The popular impression is that any ship would do for coal, but so far as those voyages you have been analysing are concerned you do not think that impression is borne out by the facts in recent years?—No, the casualties have been in high class ships. I am told as regards a number of American vessels that go from Liverpool which used to carry coal, the owners in America are sending them now with salt in preference to coal on account of the increase in the premium.

144. With regard to the owners of the ships which are used in the coal trade for those longer voyages, speaking generally you see no foundation for any imputation that they are less careful than they used to be in the selection and in the handling of those ships?—I have no reason at all to suppose so from what I know.

145. You attribute the increased proportion of casualties to what occurs on shore not to what occurs afloat?—Yes.

146. You have analysed the voyages of the larger ships on the longer voyages crossing the Equator, have you any general facts as to shorter voyages?—I prepared some preliminary statistics taking in North Atlantic voyages as well as South Atlantic voyages, and I limited it at first to all vessels taking above 100 tons of coal. I then prepared another series of statistics giving vessels which had taken 250 tons of coal and upwards.

147. Could you give us the general impression in your own mind of the result?—My impression from those statistics was that a greater number of casualties occurred in voyages across the Equator, and for that reason in subsequent investigations I limited myself to those longer voyages.

148. Is the general impression on your mind that casualties are on the increase on the shorter voyages?—I am not able without reference to say, but my opinion is from recollection that they would show about the same great increase in 1874 over 1873.

149. You think that the longer voyages are a good specimen of the whole trade?—Yes.

150. What would you call the average voyage of a sailing ship to New York for instance?—About 30 days.

151. And to the West Indies?—To the West Indies, say St. Thomas you might put on five or six days; where they are going south they get finer weather sometimes, the length of the voyage also depends on the class of ship.

152. They come within the period in which a considerable number of casualties occur according to your statistics?—Yes.

153. So far as you have carried your inquiry you have not seen any reason to discriminate between the longer voyages and the shorter voyages?—Time is an element, but I think the same thing which would operate to give the increase on the longer voyages would operate to give the increase on the shorter voyages, that is the condition of the coal.

154. Have the premiums risen in equal proportion?—Yes, irrespective of the voyage, that is, taking it apart from its character as a marine risk.

155. The premiums have risen in the same pro-

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portion for the short voyages as for the long voyages?—Yes.

156. As to the mere coasting trade, do many casualties from fire, as far as you know, occur in the colliery coasting trade?—I am not prepared to give any information upon that.

157. (*Mr. Vivian.*) You were asked as to the shipping of coal in barrows, is not it a much longer process to ship coal in barrows than in the ordinary way by tips?—It takes considerably longer.

158. Is not it the case that vessels have frequently only a certain number of days allowed them to load?—Yes, a vessel going under the tips at Liverpool, that is to say, at the cranes, can load, I am told, as much as 800 tons a day.

159. How many tons a day do you think a vessel could load with barrows?—A vessel of 1,200 tons would take I believe 10 or 12 days.

160. What number of days is a vessel usually allowed for loading?—I have no information upon that point.

161. It would take, perhaps, very nearly five or six times as long to load by barrows?—I should think that would be about the time.

162. She would be occupying dock space all that time and incurring other expenses?—Yes. With respect to shipments in South Wales, I was told the other day by a shipper who had had some experience in shipping coals there, that the shipments were sometimes very hurried, and occasionally it was to the advantage of the coal agent that the shipments should be hurried. For a consideration a coal shipper will undertake to load night and day, so that a ship may go off on a tide. I was told that it would be from 50*l.* to 100*l.* more in the coal shipper's pocket by shipping the coal off quickly, and I think Mr. Duncan knows a case where 300*l.* has been paid to hurry the vessel forward.

163. That would be inconsistent with shipping the coals in small quantities by barrows, would it not?—Yes, it would have to be done by tip.

164. Are you aware that there are some drops in South Wales in which boxes are used?—No, I have no information except from hearsay with regard to South Wales. On the Liverpool side they have boxes lowered into the hold of the vessel.

165. Do you know at all how the coal has turned out which has been shipped by boxes?—No, the returns I have been favoured with only give the number of vessels loaded under the crane; the crane may lower the wagon, which is then tipped, and the coal may fall down the whole depth of the hold, or it may have a box from a truck slung to it and this box can go into the vessel. You can only say that it has been loaded from the crane, or loaded from the high level, as it is termed.

166. Frequently a vessel is loaded partly in one way and partly in another, is it not?—I do not know.

167. Is it not the case that sometimes a column of coal is formed in the hatch by boxes, and subsequently the coal is tipped from the wagons upon that?—Those that are careful might possibly make arrangements of that sort.

168. The wagon itself is lowered just over the hatch?—Yes, as near as can be.

169. It is quite as much to the coal owner's interest to preserve the coal from breakage as it is to the interest of the person who purchases. I presume the character of his coal depends on its size?—Of course those coal agents who have a name to keep up are desirous that their shipments should turn out satisfactorily.

The witness withdrew.

Captain JOHN SCURR examined.

Captain J. Scurr.

170. (*Chairman.*) You command one of the ships of Mr. Ferguson, who is a member of this Commission?—Yes, the "Brenhilda."

171. You have carried several cargoes of coal?—Yes, two as master, but I have carried several half cargoes, and at one time when I was a seaman we carried an entire cargo.

172. The last voyage of the "Brenhilda" was your third voyage, was it not?—Yes, the second as master with an entire coal cargo.

173. On the previous occasions had you any trouble with your coal?—None whatever.

174. On the last occasion had you some trouble?—Yes.

175. Will you explain to the Commission what happened?—I found the coals got heated very much in the fore hatchway. The ship is wonderfully well ventilated; it has all the new improvements in ventilation; there are three large ventilators, one in each hatchway, coming from the keelson right up, wooden ventilators with holes pierced right through at intervals.

176. Your voyage was from where to where?—Glasgow to Calcutta.

177. When did the "Brenhilda" sail?—She sailed from Glasgow on the 23rd June 1874.

178. Where were you when you first experienced that heating?—Between the Tropics and the Equator.

179. Between the northern Tropic and the Equator?—Yes.

180. When you were between the northern Tropic and the Equator you first noticed this heating?—Yes.

181. About how long had you been out?—I should say it was 40 days. I had a long passage.

182. What did you first observe?—I observed a heating in the coals, and a strong smell of gas coming out.

183. In what part of the ship?—The forehatch.

184. What did you do?—I turned the coals over. I took the heated coals out, and endeavoured as well as I could to get to the cool coal. I took 20 tons of coals on deck to let them cool and put them in the fore peak.

185. How long did that take?—I daresay three days.

186. After that had you any further trouble?—I looked at them from time to time and turned them over.

187. Was there any coal between decks?—Yes; there was coal between decks as well as in the hold, but there was no heating between decks. It was all down in one place in the forehatch. The heating was just under the forehatch, between the afterpart of the forehatch and the foremast. We turned the coal over till we got to the cool coal.

188. And you replaced it in about three days?—Yes.

189. After that before you got to Calcutta did you notice any heating again?—No.

190. Did you take any precautions after you observed that heating?—Yes, we went and turned the coal over from time to time.

191. Between decks the coal never heated?—No.

192. What arrangements had you for ventilation?—We had three ventilators; we had one ventilator in the forehatch, and one in each of the other hatches.

193. What was the depth of the ventilator in the forehatch?—It went right to the keelson; that would be about 22 feet.

194. What did it ventilate into?—Into the hatch.

195. When the hatch was down what did it ventilate into?—The other ventilators would then carry off any foul air.

196. Supposing there was smoke or gas escaping, how would it get from the ventilator in the fore hatch to the other ventilators; I mean when the hatches were down how would any ventilation take place through the coal?—The coal was 3 feet from the 'tween decks. The ship was not full of coals; she was empty from the fore part of the fore hatch. The coal did not reach within 3 feet of the upper deck.

197. At all times and in all kinds of weather,

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whether heating was going on in the coals or not, would the ventilators reach the outer air?—Yes; we always kept the permanent ventilators open in any kind of weather.

198. (*Mr. Young.*) Had they the cowls on?—No; they are a sort of skylight, they are sloping. The masts are ventilators as well, they are iron masts.

199. (*Chairman.*) You reached Calcutta without further accident?—Yes.

201. Had you any trouble with your coal there?—Yes.

200. Will you describe what happened?—We discharged some of our cargo from the main and after hatches, and on the Saturday we found a dense smoke coming up. That was as soon as we got well down in the main hatch and the after hatch. A great draught seemed to come from aft, the wind being from north-east, causing a greater draught, and the coal seemed to ignite.

202. Will you describe what happened; what were the first symptoms of anything being wrong?—After discharging about 500 tons, the draught got into the ship and we noticed a strong smell of gas, we could not go into the fore hatch. The moment I found it out I got boats alongside, and got a lot of coolies to come on board, and I put canvas on the coolies' feet and set them to work on the coals. I put the steam donkey pump and the force pump down into the hold, keeping them constantly at work, and I kept the hose down the ventilator. I found that there was still a smoke, and that what I was doing was not sufficient to put out the fire, and I went to the port conservator and got him to let me have the steam float alongside, in case of further mishap, on account of being among a number of ships.

203. Was much water sent into the ship?—Four feet of water in about half an hour.

204. Then you got the coal out?—Yes.

205. In what state did it come out?—I should think 5 tons of this coal was taken out (*producing a specimen*) 10 feet below 'tween decks about 6 feet from the keel. It seemed to be in the middle of the fore hatch.

206. You took this coal in at Glasgow?—Yes.

207. How would you describe that coal from its look?—As half cinder, resembling coke.

208. Quite light?—Yes; there were 3 or 4 tons of that.

209. It had been in a state of half combustion long enough to reduce its weight to very little more than coke?—Yes.

210. Is it your impression that from the time when you had the indications of fire, near the Equator till you reached Calcutta, that coal had been burning?—I fancy so, on account of the heat being still in the same place; it was only 5 feet from where I found the previous heat, this was in the centre of the fore hatch, the other was between the fore hatch and the foremast.

211. What in your opininion saved you from worse disaster, was it the goodness of your ventilators?—I cannot fancy that because on previous occasions I had no trial of ventilators at all. It is a guess of mine, but I think the cause of the casualty must have been in the coals, because in some of the pieces I took up there was a stronger heat in the middle of the pieces of coal when I broke them than on the outside. I am speaking of pieces of 70 lbs. or 80 lbs.

212. Would it be your impression that it was the impossibility of any air getting to the coal that saved you from the like casualty on former occasions?—I would not like to say.

213. To go back to the coal itself, you say you sailed from Glasgow, do you know where the coal came from?—It was called Watson's coal in the bill of lading, that is all I know about it; I could not say from what colliery it came.

214. Do you know anything about the time it was in reaching you from the colliery?—It was a very short time.

215. Was it run down to the ship by rail?—Yes, the coals were taken in in four days.

216. They were put in at once?—Yes.

217. The coal was not standing a long time before you took it?—No.

218. The trucks were run straight to the ship?—Yes.

219. Was there a large proportion of small coal?—No, it was principally large.

220. Was it well picked as usual?—Yes.

221. It was not worse coal than you had had on former voyages?—No; on the former voyages I took 600 tons of small coal with large coal for Bombay.

222. What you were taking this time professed to be large coal?—Yes.

223. You knew nothing about it except that it went on board very quickly after it came from the pits?—Yes.

224. How was it put into the vessel?—By a steam crane which lifts the trucks up and tips them into the ship, we would not let them drop the coal far down.

225. It was carried by a crane and tipped. How high would the trucks be when they were tipped?—I should think 4 feet from the deck.

226. Did it seem to break very much in falling?—No, very little.

227. Did you notice whether it was damp at all?—It was perfectly dry when it came in; it was beautiful weather at the time, there was not a shower of rain.

228. It was at midsummer?—Yes.

229. Had you very dry weather going out?—I always tried to keep the coals dry, I would not let any wet get to them.

230. Had you any bad weather?—No, it was middling good.

231. Was it very close between the tropics?—It was very warm.

232. Was the air very highly charged with moisture?—Yes.

233. Were you hanging about in the tropics a long time?—Yes, I should think it was three weeks before we got the south-easterly trade. It was indifferent weather, the winds were contrary.

234. (*Mr. Vivian.*) Is the "Brenhilda" a sailing ship?—Yes.

235. (*Mr. Duncan.*) Do you know whether or not the coals which took fire in the forehatch were the same description of coals as those in the other part of the vessel?—They were the same, I believe.

236. Do you know of any reason why the coals in the forehatch should take fire any more than the coals in the after-hatch?—No, I do not know why they should; the coals which took fire seemed to be more charged with gas, they seemed to be a slatier coal, when you broke a piece it broke clean like a slate.

237. Did they look like the coals from which they get oil?—They had not any of that appearance. They seemed a slatier kind of coal.

238. You do not think that any water went down the fore-hatch by accident or otherwise?—No, I took great care of that. I always endeavoured to keep the coals quite dry.

239. At the time that you put out the fire in the fore-hatch when you were at Calcutta, by the means which you adopted, did you find the other coals quite cool in the lower hold?—Yes, all except in that one spot. They were a little warmer under the after-'tween-decks, but I attribute that to the want of circulation of the air on account of the weather. It was raining heavily at the time I was in Calcutta, that is to say, on the Saturday and Sunday.

240. (*Mr. Ferguson.*) Were there any other vessels loading coal at the time you were loading?—Yes, the "County of Perth" was loading.

241. Was the "Blair Athol" loading?—No.

242. Was she after you?—Yes, the "County of Perth" took all her coal over at Stob Cross by barrow.

243. Was that the same coal?—Yes, I believe so.

244. She loaded by barrow while you loaded by tip?—Yes.

245. Are you aware that the "County of Perth"

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was burnt?—Yes, she took fire near Calcutta about 100 miles from Sand Head.

246. The "Blair Athol" took fire at Bombay?—Yes.

247. She was loaded just after you?—Yes.

248. With what kind of coal?—I fancy Watson's Hartley.

249. During the time you were loading was there any rain at all?—No.

250. (*Mr. Abel.*) When you first found that this heating had taken place in the coal you went down as far as the heated portion went?—Yes.

251. Did you take out all the heated coals?—Yes, and turned them over.

252. You went down to the perfectly cool coal?—Yes.

253. Till you could feel no sign of heat whatever?—Yes.

254. On both sides?—Yes.

255. When the coal had got cool again did you put it back in the same place?—We lifted 15 or 20 tons and filled the coal hole up with them. I thought that was the best thing to do. We kept it for the ship's use. There was 20 tons on the bill of lading for the ship's use, so I did not put it back as I thought it would be a good opportunity to use it.

256. Was other coal shifted into the place from which you had taken out that coal?—It was just trimmed, and we left a vacant space in case of any more turning up.

257. I understand you to say that on the second occasion when the fire was discovered it was about the same place in the ship?—A little before the same place, about 5 feet before.

258. But at the time when you first observed this heating you examined the coal generally?—Yes, from time to time.

259. And you did not discover any other sign of heating?—No.

260. Did you shift the coal at all after that from time to time during the voyage?—No.

261. You did not assist the ventilation in any way?—No. I did not think the ship required it, because she was so well ventilated all round. The air could get all round the lower hold, and also 'tween decks.

262. I thought you said that it was only in unloading the coal after you had got down to a certain point when the air began to get to the coal that you noticed the fire?—Yes, that was in Calcutta.

263. Had anything been done between the two periods to stop the ventilation?—On the second occasion there was a wind from the north-east, which caused a great current of air to go through.

264. That would look as if there was very little ventilation through the coal?—As regards the body of coal I could not say. In the lower hold she was not sufficiently full in the wings or in the 'tween decks to stop ventilation.

265. So that the air circulated round the coal, but did not seem to penetrate through it?—Not through the body of the coal.

266. What time elapsed between the discovery of the heating, and when you afterwards unloaded?—Eleven weeks.

267. And you think there was no heating or fire at the time you replaced the coal, when you filled up the space after the heat was discovered?—I did not fill up the space; I left it open.

268. Then there was increased ventilation to that extent at that part?—Yes. At the time of the heating of the coal in Calcutta the principal rush of the smoke and the gas was up the ventilator.

269. Have you any reason to believe that one part of the ship was better ventilated than the other?—None whatever; it was ventilated right through.

270. Was the size of the coal much the same throughout the cargo?—The same.

271. There was very little more broken, or no more broken, in this particular lot than the other?—It was about the same.

272. You think the character of the coal was somewhat different?—I think so. It seemed a slatier kind of coal in the fore-hatch; it might have only been a truck or two.

273. (*Mr. Young.*) You say the ventilators were wooden ventilators?—Yes.

274. Was there any sign of charring upon them when you got them out of the ship?—None whatever.

275. When the fire occurred you did not find gas and vapour coming from the ventilator itself?—No.

276. The smoke came from the body of the coal?—There was a sort of steam came up the ventilator from the water going down.

277. I mean before that?—It seemed to come right up the fore hatch.

278. There was no draught in the ventilator?—No.

279. (*Mr. Icely.*) Is this (*pointing to the sketch*) a moveable cowl attached to this ventilator?—Yes.

280. Did you trim it according to the direction of the wind?—We always trimmed it off.

281. So as to be a down-cast or an up-cast?—It was an up-cast for the gas to go up.

282. Were these ventilators in the hatchways always open on the top, or did you only open them occasionally when the weather would permit?—No they would come up to here (*pointing to the sketch*). This ventilator was placed on the fore part of the hatchway.

283. Did the ventilators come through the hatchways?—No.

284. Therefore, they were not up-casts except when you took the hatch off?—That is so.

285. (*Mr. Cory.*) Though they do not come through the hatches they are always open, are they not? The ventilator is still a ventilator though the hatch is closed?—Yes.

286. (*Mr. Icely.*) Are you certain that there was a space between the deck here (*pointing to the sketch*) and the surface of the coal?—I could travel from this coal right along to the fore hatch.

287. And these (*pointing to the sketch*) were constantly open?—Yes, in whatever weather. In fine weather they were all open. These hatches (*pointing to them*) were all off. There are four sections of hatches between decks. I took the precaution of keeping them all off.

288. (*Mr. Ferguson.*) Had you the wing hatches off as well?—Yes; and the mid-ship hatches too. I stood them up against the side of the ship.

289. (*Mr. Icely.*) Was this (*pointing to the sketch*) an up-cast?—This was a down-cast.

290. Could you get the air down there;—Yes, when it did not rain. The moment it came on to rain we turned it off.

291. This ventilator with the cowl was used as a down-cast?—Yes.

292. And this as an up-cast?—Yes.

293. Were these masts also utilized as up-casts; are there perforations in the masts as well?—Yes. Then in our lazarette there was a grating that was always off, which caused a great draught. The rush of air was through here (*pointing to the sketch*).

294. (*Mr. Ferguson.*) Had you your hatches often off?—Yes; always when it was not raining.

295. During what portion of your voyage had you them off?—During half the passage they were only put on at night, but the flap of the booby hatch was always down.

296. (*Mr. Icely.*) How did you ascertain that the cargo was becoming heated?—You could tell by the heat and smell the moment you went down.

297. You did not take the temperature by the thermometer?—No, In fact it was a thing I forgot to take with me.

298. Is it the custom to take a thermometer in ships?—Not that I am aware of.

299. Or to test the temperature in the hold in any way?—Not that I am aware of.

300. Do you think if the temperature of the cargo were tested at different points throughout the cargo,

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the means of discovering the seat of the fire would be afforded?—I dare say that might be done. It is one of those things that masters and mates, I am sorry to say, do not think of till it breaks out upon them.

301. You found the seat of the fire by walking along the deck and finding that it was hotter in one place than another?—Yes, I found smoke rising there (*pointing to the spot*). We could get right over the coals fore and aft. We could see anything rising in the way of smoke and gas.

302. (*Mr. Fenwick.*) What was the quantity of your cargo?—1,776 tons.

303. Was your vessel built of iron or wood?—She was an iron ship. It was her first voyage.

304. (*Mr. Cory.*) Upon the whole do you think you are better without ventilators or with them?—I think I should be just as well without them, looking at the way in which the ship is ventilated in other respects.

305. (*Mr. Vivian.*) Have you often carried cargoes of coal?—No, only on two previous occasions. I have several times carried half a cargo of coals.

306. On the previous occasions did you have ventilators?—None whatever.

307. Was the coal which you carried on the former occasions the same description of coal?—No, it was from the north of England.

308. If you had to load this same description of coal would you prefer to have ventilators or to have no ventilators?—I should leave that to my owners.

309. What would be your own judgment about it?—I am not able to give a confident opinion upon it. But speaking for myself, I would as soon go to sea with a ship that was not furnished with ventilators as with a ship that had them, provided then a stream of air got to the coals, or if the coals had been loaded out of barges.

310. That is to say, if they were put on board gently?—Yes, if they were taken from a craft alongside.

311. And lowered down into the hold?—Yes.

312. So that they would not become too dense in the ship?—Yes, I fancy myself from what I have heard that the heating of the coals is due to the coals coming direct from the pits into the trucks?—A sufficient time is not allowed for the gas to escape from them as used to be the case a few years back.

313. Will you give us the exact history of the occurrence of the fire at Calcutta. When did you commence to discharge?—On the Tuesday I broke bulk, and on the Saturday evening following we observed the smoke.

314. From the Tuesday to the Saturday the hatches were off and the cargo was being discharged?—Yes.

315. Was it being discharged at all the hatches at once?—No, from the main and after hatches. I was discharging from the after-hatch by coolies, and from the main hatch by the steam winch. The fore hatch was untouched.

316. That went on during the period between the Tuesday and the Saturday?—Yes.

317. How much coal was taken out between the Tuesday and the Saturday?—I should think 500 tons.

318. A freer circulation of air must have been caused after that quantity of coal was discharged?—We were well down in the main hold then.

319. You were well down in the main hold before the fire occurred?—Yes.

320. And consequently more air must have passed down?—Yes.

321. Then on the Saturday evening a dense smoke occurred?—It was slight on Saturday evening, then it increased on the Sunday.

322. Did you between the Tuesday and the Saturday examine the main hatch at all?—No.

323. Then you did not know whether the heat was gradually increasing during that period?—I could not say.

324. Your attention was attracted to the smoke rising?—Yes, on the Saturday evening the night watchman came and reported that there was a strong smell of gas, the fore hatch was off then. When the rain had ceased the the hatch was taken off to allow it to get cool, but he reported that there was a strong smell of fire coming up the fore hatch.

325. Did you smell it?—I went and smelt it.

326. What was the smell like?—A strong gasy smell.

327. Was it anything like ordinary gas?—It was a sulphury smell, a stifling smell.

328. Like a sulphur match?—A very stifling smell.

329. Was it anything like the smell when an ordinary fire-place is smoking?—No, nothing like it; it affected your breath, it was a stifling smothering smell.

330. What occurred after the Saturday evening?—On Sunday I could not do anything. I was going constantly to and fro. I found that the smoke and heat was increasing, and on Monday morning I got the donkey engine and the force pump to work and put down the hose, and as soon as I thought the office of the port conservator would be open, I went to the port conservator and got the steamfloat alongside.

331. By that time what was the condition of things?—It was getting worse and worse.

332. There was more and more smoke coming?—Yes, the steam donkey pump and the force pump were not sufficient to keep it down; they kept it down to a certain pitch, but the floating engine put it out instantly.

333. If you had been at sea you would only have been able to use your donkey engine?—Yes, the donkey pump, the head pump, and the fire engine.

334. Would they, in your judgment, have been sufficient?—Yes, I think so, if I had turned all hands to putting out the fire.

335. You think you would have had pumping power enough to extinguish the fire?—I think so, only as this fire-engine is kept on purpose at Calcutta I thought I might have the use of it. If I had been at sea we would have strained every nerve to put it out ourselves.

336. You said that on breaking some of the pieces of coal which were comparatively cool outside, you found that they were in a state of ignition inside?—There was a strong smoke arose when one of those pieces was broken.

337. You exposed more surface in breaking it?—It did not feel so warm outside as inside; it was only in some of the pieces of coal that we observed that. As the men passed them up, I saw a smoke rising from them, and I broke them on deck.

338. Do you think it possible that that coal had been submitted to the action of water outside, which had cooled the external surface, and had not cooled the inside of the coal?—I don't think it. I was very cautious not to let any wet get to the coals.

339. Are you speaking of when you turned over that coal at sea, or of the occasion when you discharged part of your cargo in Calcutta?—When I turned the coal over at sea I found this smoke.

340. And then you found the blocks of coal were cooler on the outside than in the inside?—Yes, if you struck them they would all fall to a crumble, and there was much heat inside.

341. Was there much small coal?—No.

342. The bulk of it was large coal? — Yes, ordinary sized coal, there were some very large pieces among them.

343. Did you find pieces of 20lbs. weight, for instance, in a state of heating?—No. I tried one or two pieces when the men were passing the coals up, and I let them lie on the deck to cool till I put them down the fore peak.

344. Did you remark any brassy look in the coal?—No. I did not notice that there was a shiny appearance.

345. A black shiny appearance; not a yellow appearance?—There was some of that on the coal too;

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Captain J. Scurr.
1 June 1875.

there were gold looking streaks in some of it. I did not notice it in that which I broke, but I saw some of that on the coals like a vein of gold.

346. Was there more of that in the portion of the coal which was on fire in the fore hatch than there was in the other portions?—I did not take notice of that.

347. (*Chairman*). Do you know iron pyrites when you see it?—No.

348. Your impression is that the cause of the heating of the coal was its being brought too rapidly from the bottom of the colliery into the ship?—Yes.

349. The coal you had been accustomed to take before had been exposed to the air longer?—Yes.

The witness withdrew.

Adjourned to Tuesday next at 12 o'clock.

Tuesday, 8th June 1875.

PRESENT:

THE RIGHT HONOURABLE HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
JOHN PERCY, Esq., M.D., F.R.S.
WILLIAM YOUNG, Esq.
J. M. CARMICHAEL, Esq., Secretary.

Mr. CHARLES TULLY examined.

Mr. C. Tully.
8 June 1875.

350. (*Chairman.*) You are a shipowner at Newcastle?—Yes.

351. I believe you have had some experience of cases of spontaneous combustion or explosion on board your ships?—I have.

352. Have you a large fleet?—We have 19 altogether.

353. Are many of them employed in the coal trade?—The whole of them are employed in the coal trade.

354. And I believe within the last few years you have had more than one instance of spontaneous combustion?—We have had two vessels burnt at sea.

355. One as far back as 1865?—Yes, 10 years ago.

356. And the other more recently?—The other was in January 1873.

357. Are those the only instances that have occurred in your own fleet?—They are.

358. Will you give the Commission some information about the first case; what was the nature of the casualty?—The ship was loaded with smelting coals from Swansea bound to Valparaiso. She was properly ventilated, because in West Coast charters we have always been bound to ventilate the coals properly, as smelting coals are more likely to take fire than steam coals. When she got off the river Plate the men felt the heat, and it gradually got worse and worse till she burned altogether. That was after she had been 60 days out.

359. Have you any recollection of the manner in which the coal was put on board?—It was put on board in the usual manner, but I believe it was during wet weather.

360. Was it tipped?—It was tipped in the usual way at Swansea.

361. Do you remember what the condition of the coal was when it came on board; was there any objection to it on account of its dampness?—I cannot remember that.

362. Was there any suspicion that the coal contained pyrites?—It was just the same as the ordinary smelting coals; they are very full of gas.

363. Will you describe how the ship was ventilated?—At the present time they have iron ventilators, but we had wooden ventilators like spouts, which communicate with different parts of the vessel. These ventilators come up to the hatchway.

364. To each hatchway?—To each hatchway.

365. When the hatches were down did the ventilators act?—They would only act to a certain extent.

366. So that in bad weather when the hatches were down the ventilation would be imperfect?—Yes.

367. Do you recollect any other special circumstance connected with the casualty which would tend to indicate the cause of it?—No; not any further than the nature of the coals. Smelting coals are very full of gas.

368. Was the ship totally destroyed?—Yes. The fact was the men could not do anything with her: they had to come out of the cabin at last, they felt the heat so much. The ship took fire gradually, and the men had to leave her.

369. (*Mr. Duncan.*) Had your ventilators any connection the one with the other: had you any trunk below connecting the ventilators?—Yes; we had the trunk that we carried the copper ore in on our return voyages.

370. You had a double bottom?—Yes.

371. Was each ventilator put through that double bottom?—Yes, the ventilators were put through the double bottom.

372. Did they endeavour to put water down the hold?—Yes.

373. They poured water down the ventilators, and did everything they could for some time?—Yes.

374. (*Mr. Ferguson.*) Do you know whether the hatches had been much off during the voyage?—Not expecting to be asked that question, I did not ascertain that, but I should think that during fine weather they would be off. We generally give instructions to that effect, that whenever it is possible to have the hatches off they are to be off.

375. Had she a permanent ventilator?—Not through the deck. When the hatches were on there might be a little ventilation, but it would be very imperfect.

376. Was she a wooden or an iron vessel?—Wooden.

377. What was her size?—460 tons register; she would carry about 700 tons.

378. She would have 15 feet depth of hold?—She would be more than that; she would be 17 feet I should think.

379. Was she filled with a full load of coals?—Not quite a full load.

380. (*Dr. Percy.*) Do you know from what colliery the coal came?—I cannot say.

381. Was it small coal, like slack?—Yes.

382. There was not much lump in it?—No, it was smelting coal.

383. Smelting coal is what we should call slack?—Yes.

384. I suppose it would be difficult to ventilate a mass of slack?—Yes, very difficult.

385. (*Mr. Abel.*) Have you been in the habit of shipping this particular coal?—We have been years in the trade, and all the time that we have been in the trade we have been shipping the same class of coal.

386. Have you any reason to believe that there was anything exceptional in this particular cargo of coal?—No, except that I think the weather at the time was very wet when they were shipped.

387. You are not aware whether the coal had been

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long exposed before shipment?—No, I could not say that.

388. (*Mr. Young.*) What was the name of the ship?—The "Morning Glory."

389. Were there any premonitory symptoms of fire: was there any smell of fire or gas beforehand?—If I remember rightly, the men for some days before felt that there was some fire about the vessel.

390. That is to say, they noticed the heat coming up the ventilators?—Yes.

391. Were the ventilators showing any signs of charring?—Very probably.

392. (*Mr. Icely.*) Were your men in the habit of taking the temperature of the coal by a thermometer?—No, I do not think they were at that time.

393. That has never been the practice?—No, it had not been the practice as far as we were concerned; it may be at present, it was not then.

394. (*Chairman.*) Now as to the second case, the second case was in January 1873?—Yes.

395. What was the ship's name?—"The John."

396. She was on a voyage also from South Wales to Valparaiso?—Yes, Porthcawl to Valparaiso.

397. Will you state what the nature of the coal was?—The same kind, smelting coal.

398. From the same colliery?—No, from another colliery, but it was the same character of coal.

399. Do you know from what colliery it came?—I cannot say exactly.

400. It was shipped at Porthcawl?—Yes.

401. Where did the combustion take place?—Off the Falkland Islands, when she had been 100 days out.

402. In the former case the ship had been about 60 days out?—Yes.

403. Do you remember the circumstances under which the ship was loaded: was it wet weather?—Yes.

404. Was the coal received on board in the usual way?—Yes.

405. Was it as small coal as the other?—It was about the same character of coal; it was smelting coal.

406. How was the "John" ventilated?—In the same way.

407. Was she about the same tonnage as the "Morning Glory"?—She would have about 580 tons on board.

408. She was rather a smaller ship than the other?—Yes.

409. Was the fire suspected some time before it broke out?—Yes, some days before. They felt the heat in the cabin some time before.

410. Do you remember what they did when they first found it out?—They threw water down.

411. Was the ship burned?—Yes, they ran on shore on the Falkland Islands to save their lives.

412. Both became total losses?—Both became total losses.

413. Was there any suspicion of the presence of much iron pyrites in the coal?—Not to my knowledge.

414. In fact the two cases were on all fours?—Yes, just about the same.

415. (*Mr. Ferguson.*) Was she a wooden vessel likewise?—Yes.

416. (*Dr. Percy.*) In 1873 the price of coal was very high, was it not?—Yes, in 1873 and 1874.

417. I suppose it is probable under those conditions that an inferior kind of coal might be supplied?—I cannot say that.

418. There might have been rather more slack than usual?—I cannot say.

419. (*Mr. Fenwick.*) You say she was fitted as a copper ore ship?—Yes, with a platform and trunk, so that when the ship was coal-laden the platform would be down, but the trunk would be taken away, leaving the uprights.

420. What space was there between the platform and the bottom?—Four feet.

421. (*Chairman.*) Have you any suggestion to make to the Commissioners on the subject referred to them, which is, what precautions should be taken to prevent the spontaneous combustion or explosion of coal, or what special steps should be taken when the existence of combustion is suspected?—In the case of smelting coals or gas coals much more difficulty arises than in the case of steam coal, but I think as regards small vessels on short voyages it would be a sufficient precaution if for a little time after the vessel was loaded, the hatches were kept off every fine day during the voyage; but in a larger vessel, where there is a greater quantity of coal, and where the voyage is longer, I think she ought to be properly ventilated. I think those vessels which are not fitted with trunks ought to have ventilators on each side of the keelson, and a ventilator up each hatchway and one besides those between the hatchways. A large vessel ought to have ventilators within a foot of the deck at least, and I think she ought to have screw ventilators some height above the decks, so that the water would not go down.

422. Those are all the precautions that you think would be necessary?—My own idea is that the heating of the coal is attributable to a great extent, to the coals being shipped fresh from the colliery, they come direct out of the mine into the vessel and as they fall into the vessel they break and the gas generates about the vessel. But you could not very well remedy that, the only remedy would be to apply precautions on board the vessel at sea. In former years the coals used to be allowed to lie in heaps some little time and the gas got away before they were shipped; but now they come, one may say, red-hot out of the mine.

423. Do you think they will continue to come, as you describe it, red-hot out of the mine, even when the price falls as it is falling?—Yes; because they will not work them in advance of the demand for them.

424. Is it your opinion that the intervention of Government, by means of a special inspection of coal-laden ships, would be of any advantage?—I think if there was a general law laid down providing for certain precautions, it would be acceptable to shipowners and it would be observed by them. All the owners that I have come near are anxious to save their vessels and they would be very glad to ventilate them. In fact, most of the merchants have the provision inserted in their charters, that the ship is to be ventilated.

425. You think if the law provided that certain precautions should be taken, the anxiety on the part of owners to save their own property would be quite sufficient an inducement for those precautions to be taken, and it would not be necessary to have an army of inspectors to inspect coal-laden ships?—Not at all.

426. What would you prescribe by law as to the ventilation of coal-laden ships?—The difficulty would be this, that each different vessel might require to a certain extent a different kind of ventilation. For instance in an iron vessel you might have permanent ventilators in different parts of the vessel, such as the stanchions and the timber heads might all be ventilated; but in a wooden vessel you would have to depend on screw ventilators on deck.

427. Could you formulate those requirements in any way, so that they could be expressed in a law, or in regulations having the effect of law?—I think it would be quite possible.

428. Do you think the Board of Trade could be empowered to make regulations?—Yes

429. How would they be enforced?—There is the difficulty; unless there were some person to see the vessels when they went away, I do not see how the regulation could be enforced.

430. You have not perhaps thought that point out? No. Before I left Newcastle I was told there was an old captain who had saved two or three vessels after a fire had taken place. He did it in this way (*producing diagram*). He had a number of wooden cones made, which he put on the top of one another as he dug down to the heated coals. He would put down one of these cones, in the inside of which there would be room for a man to work the coals, and then when he had got down to a certain depth he would put another cone on the top. He saved three vessels by that means. The cones would be 4 feet high by 4¼

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Mr. C. Tully.

8 June 1875.

feet wide; there would be just room enough in them for a man to work. One man could not work in them for very long; he kept changing the men and kept working down, making a sort of shaft as it were.

431. Did he keep a stock of those on board?—Yes, he saved three vessels in that way, the "Cambria," the "Manfred," and the "Druid." They all took fire by the heating of the coals, and he saved them in that way.

432. (*Mr. Duncan.*) If those cones were only four feet square he could manufacture them out of inch and a half boards?—He must have made them on board.

433. (*Chairman.*) He did not take them with him?—No, he did not anticipate the fire.

434. (*Mr. Young.*) Did he make them after the fire began?—I cannot answer that question; he got them right down to the spot where the fire was. He told me that from the working of the cargo in the ship there was very little labour after the first one had been got down; it was just a matter of getting the first one down.

435. (*Chairman.*) What depth would the cones in that diagram represent?—About 18 feet.

436. (*Mr. Cory.*) That diagram is not intended to represent the precise number that would be required?—No.

437. (*Mr. Duncan.*) You say that for the purpose of ventilating the upper part of the vessel below the upper deck you would have screw ventilators?—Yes.

438. Have you ever seen the ventilator which is called McKinnel's ventilator, which has an up and a down shaft?—No, not to my knowledge.

439. A ventilator which has an outer and an inner jacket?—No, I have not seen it.

440. Such a ventilator as that which would constantly act would be better than your proposal?—Yes.

441. (*Mr. Ferguson.*) You have given us the particulars of two casualties which have occurred out of the whole number of coal-laden vessels which you have sent away during the time you have been a ship owner; what has been the total number of coal-laden vessels you have sent away?—Very many; we send between 400 and 500 cargoes away every year.

442. The proportion of burnt vessels to the total number of vessels you have sent away would be very small?—Very small indeed; I could not say how many years we have been shipping coal, but a great many years, and we only have had those two cases. That sort of casualty has mostly taken place of late years in the case of very large vessels bound to India, and it has taken place more with steam coals than with other coals. We have a fire-engine on board all the vessels, that is to say, one of those small engines they wash the decks with, and in case of fire they put the hose over the side of the vessel, and pump the water.

443. Is it not a steam pump?—No, a hand pump.

444. (*Dr. Percy.*) You spoke of the occurrence of spontaneous combustion; have you had any experience of explosion from gas?—No; I have known two or three instances on the Tyne, where after the gas coals had been loaded and the hatches had been put down, immediately the vessel blew up altogether, that is to say within two or three hours afterwards. In those cases the vessel had not begun her voyage, but the hatches had been put down, and the coals being full of gas, they caused an explosion.

445. Did I rightly understand you to express an opinion that steam coals were more liable to fire than other coal?—No, smelting coals are more liable to fire, but of late years the steam coals have been shipped in large vessels that they have taken fire more than the ordinary smelting coals which have been shipped in smaller vessels.

446. What particular kind of steam coal do you refer to, Welsh coal or north country coal?—Some of the north country; my experience is more in connection with the north country coal.

447. Do you know of any case of spontaneous combustion in the case of Welsh steam coals?—I should think there have been such cases; those vessels to which I allude carry between 2,000 and 3,000 tons, it is a great quantity of coal to be put in one vessel.

448. (*Mr. Fenwick.*) Do you ventilate all your vessels?—Yes, that is to say all vessels going any distance, not if they are only going to Spain or Portugal.

449. Your impression is that ventilation is very important?—For a long voyage.

450. (*Mr. Cory.*) I presume with respect to ships employed in coasting voyages it would be quite unnecessary to ventilate them?—Yes, they are only three or four days out.

451. Are you aware of any fire having taken place in those cases?—I never heard of one. I have heard of them being blown up after being loaded. Being small vessels there is not the same quantity of gas generated in the vessel.

452. (*Mr. Duncan.*) You have had great experience in shipping coals; you are a coal exporter?—Yes.

453. What is your experience with reference to the coals that are shipped in the present day, as compared with the coals which used to be shipped in former years, say ten or a dozen years ago, are they as well screened now, and in as good order for shipment as they used to be?—Better, I think. The screens are better now than ever they were, and the mode of shipment is better. In former years they lowered the coals down in wagons, and they knocked out the end of the wagon when perhaps it was 10 feet above the vessel. Of course all the coals went down, breaking as they went. Now they have spouts. The coals shipped by spouts certainly do break in large vessels, on account of the depth of the hold, but the spout itself comes down close to the hatchway of the vessel. They do not load the coal by wagons as they used to do.

454. Where are those coals screened?—At the pit before they come down to the spout.

455. How are they screened?—They have a large metal screen, and as the coals come out of the pit they are put through the screen, and the small coal goes one way and the large goes another.

456. Is it not the case that the coals come up in the truck from underground, and are then run on a railway to the edge of the staging to the screen upon which they are tipped?—Yes.

457. And the coal when screened goes direct into the wagons that go to the ship?—There are two wagons; one of the wagons receives the small coal, and the other wagon receives the large coal.

458. The one that receives the large coal stands at the end of the screen, and the one that receives the small coal stands under the screen?—Yes.

459. If there is a considerable slope do not you think it quite possible that some of the unscreened coal as it runs down may get mixed with the screened coal?—No.

460. In the rush down from the top of that screen to the bottom of it, might not a good deal of dust get into the large coal?—No, not much.

461. You are prepared to say that according to your experience coals are as well screened now as formerly?—Double screened coals which are the best steam coals are free from small when they are sent from the pit, of course they break afterwards.

462. Have you any reason to believe that on account of the high price that has been paid for coal, there may have been a temptation to the coal owners to ship a lower class of coal?—They could not do so, because their pit only produces a certain class of coal. For instance, north of the Tyne we have our steam coal pits, and those pits only produced the steam coals; we have other pits that produce gas coals.

463. In some of those pits many different seams, in the same pit.

464. Would you consider house coals as safe to ship as steam coals?—Quite as safe.

465. Would they be as a rule as well screened?—I think so.

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466. Supposing when a vessel was being loaded with steam coals they had not the necessary quantity of steam coals, and they made up the quantity with ten or a dozen tons of house coals, would that have an injurious effect upon that cargo?—No; it would not produce the steam when it got to its destination; but, so far as regards safety in carriage, I think it would be as safe. It would soon be detected that it was not steam coal, and the shipper would not get another order.

467. (*Chairman.*) Can you give the Commission the number of ships and the tonnage of the coal you have sent out?—We ship between 400 and 500 cargoes a year. I should say on the average they would be 300 to 400 tons.

468. (*Mr. Icely.*) Is it the custom to shelter the coal before shipment?—No, they could not do that; it comes down direct from the pit; if it is wet weather it receives the wet, and if it is snowy weather it receives the snow.

469. (*Mr. Young.*) I understand you to say that both those vessels were built to carry ore home; do you think the platforms and other things in ore ships tend to facilitate combustion, or to stop it?—I think so, they tend to prevent it. I think that has been proved by the very few copper ore ships that have been burnt.

470. The platforms are all made of wood?—Yes.

471. If there were combustion at all the wood would assist it?—With the platform above, and the ceiling underneath, there is always a current of air.

The witness withdrew.

Mr. James Finlay examined.

472. (*Chairman.*) You have been master of a ship for some time?—Yes, from 1852.

473. And you have been carrying coal in the ships of which you have been master?—Yes, constantly.

474. I believe you have had no case of combustion since you were master of a ship?—No.

475. When you were chief mate you had a case, I believe?—I had one case, in 1851.

476. Will you describe to the Commissioners the particulars of that case?—The ship was the "Alfred" of Belfast. She was loaded in London. The coals were brought from the Tyne in colliers. She was 1,073 tons register, and we only took 1,050 tons of coal.

477. You were only half full?—About half full, a little more. The coals were shipped on owner's account, bought in the London market. I noticed the coals were small sized. I noticed they were weighed into the ship in drafts of 2 cwt. at a time by a sworn meter. She was bound for Valparaiso. We got on all right till we were off Conception, within a few days' sail of Valparaiso, when one morning, at daybreak, on opening the hatches we found a strong smell of coal gas; that was the first intimation of there being anything wrong. Soon after that smoke began to ooze up through the coals. We dug a large pit in the coals where the smoke was coming up the most, as deep down as we could, as long as the men could stand, for the smell of the gas made them sick. We then cut a hole in the upper deck over that, and poured down water and filled the pit quite full till it overflowed. The water did not seem to penetrate the coals much, as it overflowed and ran down by the ship's side. It was all of no avail, the smoke and heat increased in the hold, fire broke out, and about 60 hours after we first discovered that there was anything wrong we were driven out of her. The ship was then like a volcano.

478. The ship was lost?—The ship was lost.

479. Was the coal steam coal?—I could not say.

480. You described it as being small coal?—I noticed that it was small-sized coal.

481. It had not been screened I suppose?—I do not know.

482. Do you know how the ship was ventilated?—There was no ventilation whatever through the coal. We kept the hatches open in fine weather. We kept them on at night, and opened them in the day.

483. She was not a regular coal-carrying ship?—No.

484. Was it the first time she had carried coals?—Yes.

485. She was an ordinary cargo ship, not fitted for carrying coal, in fact?—Yes.

486. It was a case of combustion in an unventilated ship?—Yes, that ship had no 'tween decks. I consider 'tween decks a great help to a ship in the way of ventilation.

487. Have you had much experience of coal carrying since?—Yes; I have carried 15 cargoes to the East Indies and China, some of them very large, over 1,800 tons.

488. Within the last few years?—Within the last 20 years.

489. Have those ships been generally fitted for the carrying of coal?—Yes, they were ventilated.

490. How were they ventilated?—Wooden ventilators ran fore and aft through the bulk of the coals in the lower hold; 'tween decks they were not required as there is only a limited thickness there. This is a model of the ventilators which are put through the lower hold (*producing it*).

491. Those were put horizontally?—Yes, fore and aft, on each side of the stanchions. Suppose this is the middle of the ship, on each side there is a line of these ventilators fore and aft.

492. (*Mr. Duncan.*) At the bottom?—No, in the middle. In the ships I have commanded the lower hold would be about 16 feet in depth, and the 'tween deck about 7 or 8. The ventilators ran through the centre of the lower hold.

493. (*Chairman.*) Have they all been fitted in that particular way?—In that particular way.

494. Is that plan of ventilation your own invention?—No.

495. Is it a common plan?—It is a common plan adopted in vessels loading at Birkenhead.

496. What upright ventilators had you besides?—We had one in the main hatch. We connected the two ventilators in the main hatch, and put one upright in the after part of the main hatch.

497. Was there nothing up the fore hatch?—We kept the ends of the ship clear right down to the keelson, and these fore and aft ventilators projected through both at the fore end and the after end.

498. If the hatches were down what ventilation would the ship have then?—We had always some scuttles down through the forecastle and down aft, and four cowl-headed ventilators through the poop and forecastle open all weathers.

499. All ventilating upwards?—Yes.

500. Nothing ventilating downwards?—No; except that some of the mouths of the ventilators were generally turned to the wind, and the others from it.

501. So that some would ventilate downwards, and the others upwards?—Yes, according to the wind.

502. According to your experience that method is a very satisfactory one?—Yes.

503. Have you carried coal of all kinds—north country coal and South Wales coal, bitumenous coal and non-bitumenous coal?—The principal coals which I have carried were North Wales coals, Brymbo coal. We shipped one cargo of Merthyr steam coal at Birkenhead.

504. Have you ever had any suspicion of heat in any coal which you have shipped?—No.

505. Do you attribute your immunity in any degree to satisfactory ventilation?—Entirely, and keeping the hatches open.

506. You say that that system is common in Birkenhead ships; do you mean that it is adopted in all ships sailing from Birkenhead?—I cannot say that it is universally adopted. I know that a good many have it.

507. Do several different owners apply the same

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Mr. J. Finlay.

8 June 1875.

plan?—Yes, I believe so. The firm by whom I am employed have a great many coal-laden ships, and in those ships this plan has been invariably adopted, instructions being given to keep the hatches open.

508. (*Mr. Duncan.*) As to that cargo which you took from London, was it small coal like what you would call smithy coal?—No, it was ordinary coal.

509. Such coal as you see discharged from vessels in London for steam purposes?—Yes.

510. It did not appear to have been very well screened, but it was steam coal?—Yes.

511. It was not small coal?—No, not small coal entirely, there was some large among it.

512. The two handlings of the coals, first in the shipment on board the brig, and then on board your vessel, would have a tendency to break the coals; would not the distance which they would have to fall break them a great deal?—The depth they would have to fall in the ship's hold would be gradually decreasing, there would be a very small fall towards the end of the shipment. The coals were wheeled away from the hatchways in barrows.

513. Was she a colonial-built ship?—Yes, a St. John's built ship.

514. From the way in which she was loaded the whole weight of the coal would go down upon that which was at the bottom, and make it closer?—Yes.

515. Do not you think it would be an improvement in the case of those vessels which you say are ventilated in the way you have mentioned, if you had one shaft coming up through the quarter hatch, and another shaft coming up through the fore hatch, with which shafts the horizontal boxes which you say you placed fore and aft among the coals could communicate?—Yes, no doubt it would.

516. (*Chairman.*) That is a very cheap method of ventilation, is not it?—Very cheap.

517. What would it cost in the case of a ship carrying 1,200 tons?—The ship in which I sailed last was a ship 1,300 tons, and I reckoned that it cost about 13*l.* for the material.

518. The original cost?—Yes; the ship's carpenter made it on board as it was required, and saw the ventilators properly placed.

519. (*Mr. Ferguson.*) Do you know whether any of the other vessels which have from time to time loaded at Birkenhead, and which have adopted that plan of ventilation have taken fire?—I do not know of any; the employers for whom I sailed had at one time over a dozen ships, and they were nearly always carrying out coals to the East, and I never heard of a case of combustion in any one of them.

520. Have you heard of any casualty occurring in the case of any of the vessels which loaded at Birkenhead with the same coal, and which adopted the same method of ventilation?—No; I never heard of any casualty having occurred in the case of any one of those vessels in which that plan of ventilation had been adopted.

521. (*Dr. Percy.*) How long has this system of ventilation been in operation?—For over 20 years to my knowledge.

522. (*Mr. Abel.*) Are you in the habit of examining the cargo periodically, or the ventilators, to ascertain whether the coal remains cool?—I was in the habit of visiting the hold each day.

523. Is that a rule laid down by you on board ship?—No, not a stringent rule, but I made it part of my duty to go over every part of the ship every day.

524. You do not keep a record of having inspected the cargo, and seen whether there is any heating?—No.

525. (*Chairman.*) Do not you mention it in the log?—No.

526. (*Mr. Abel.*) Have you ever known a case of explosion on board a coal-laden ship?—No.

527. (*Mr. Young.*) Most of the cargoes you have carried have been from Birkenhead?—Yes.

528. You are in the employment of a Liverpool firm, I believe?—I was till I left off going to sea in 1872.

529. What is the name of the firm?—Messrs. J. and T. Sinclair of Belfast and Messrs. W. and P. Sinclair and Co. of Liverpool. I have taken three cargoes from Sunderland.

530. (*Mr. Icely.*) What is the name of the coal you have been in the habit of carrying?—Brymbo. One cargo I took from Birkenhead was Merthyr steam coal. From Sunderland it was Londonderry and Cowpen coal.

531. You have carried all those coals which you have mentioned?—Yes.

532. And never had an accident with them?—No.

533. Are you in the habit of shipping coal in all weathers?—Yes, I have shipped coal in wet weather.

534. You have known a cargo to be wet when shipped?—A little wet.

535. Charged with moisture?—Yes.

536. Still no accident has occurred?—None whatever.

537. (*Mr. Fenwick.*) You must have met with a great many other ships which have taken coals out to India; do you know whether they have all been ventilated?—There is a great diversity of opinion about ventilation; some captains are strongly in favour of ventilation; the majority I have talked with on the subject are in favour of ventilation, others are not.

538. You do not know whether every coal-laden ship that sails for India has been ventilated?—No; the majority are in favour of ventilation, but I have met with some, a few, that do not believe in ventilation.

539. (*Mr. Cory.*) Most of those cargoes which you loaded at Sunderland, and those you shipped at Birkenhead, came direct from the colliery to the ship?—Yes, as far as I know.

540. In the case of the particular cargo which you loaded in London, they had been some time out of the colliery, no doubt?—Yes.

541. They had had a thorough airing?—Yes.

542. Nevertheless, that particular cargo was the one that took fire?—Yes. We did not think there were any particular precautions necessary as the vessel was not taking a full cargo.

543. (*Chairman.*) May I sum up your evidence as expressing this, that provided that system of ventilation was applied to which you have referred, and provided the hold is visited every day, you would feel perfectly safe in carrying coal to any part of the world?—Yes.

544. You believe that those are all the precautions that are necessary to be taken?—Yes; and keeping the hatches off night and day.

545. Whenever the weather allows?—Yes.

The witness withdrew.

Mr. J. P. Newton.

Mr. JOHN PAUL NEWTON examined.

546. (*Chairman.*) You have been for some time commanding a coal-carrying ship have you not?—I have been in several ships carrying coals.

547. For how many years?—Since 1842.

548. How long have you been a captain?—Twenty-two years.

549. Have you made many voyages every year?—Yes. I have not been carrying coals continuously, but from time to time during that time.

550. How many voyages altogether have you made with coal?—I have carried coals from England to the Baltic once or twice, once to the Mediterranean, twice or three times to the Brazils, once to Calcutta, once to Shanghai, once to Japan, and once to Aden.

551. During the 22 years that you have been making voyages as a captain, have you had more than one case of spontaneous combustion?—Only one case.

552. Will you describe to the Commission what the particulars of that case were?—The vessel which was called the "Lochee," was loaded in the Tay, off Tayport, in the month of September, 1864. The weather was very wet and there were gales of wind every day. The coals were brought off in lighters, and the lighters

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in some cases were nearly foundering alongside, so that the coals were thoroughly saturated with both rain water and salt water. The coals were filled in tubs and whipped on board ship out of the lighters.

553. They came on board very wet?—Thoroughly saturated with wet. The ship just had her registered tonnage; she was not nearly full. She had 90,000 cubic feet of spare space. Her registered tonnage was 1,500 tons, and she only had 1,500 tons of coal in her. We sailed on the 17th of September, 1864, for Calcutta. Then on the 4th of January, 1865, about three months afterwards, we discovered a little smoke from the coals. On discovering this smoke I lowered the thermometer so as to get the temperature, which I found was very high, and I considered then that if she was not burning, she would very soon begin to burn. I was then in the Bay of Bengal. I immediately bore up for Ceylon, and when I was in sight of Galle she blew her decks out from end to end. That was a thing I had never heard of before or expected. I never apprehended any danger from explosion. No one could credit the force of the explosion. The decks were literally blown out. All the men were burnt and bruised. She went into flames immediately and we all got out of her as quickly as we could.

554. To what do you attribute that casuality?—I have not the least doubt that it was from the coals having been shipped wet. On the voyage before that, we had in the same ship 2,000 tons, which we shipped in London, and at that time she went perfectly safe. They were loaded then from small vessels, and the coal came from the north of England.

555. What coal was it in this case?—It was coal from the Town Hill Colliery in Fifeshire.

556. What coal is that?—Steam coal.

557. Since that casualty occurred I believe you have carried no coal?—No.

558. (*Mr. Duncan.*) I suppose you have known cases of this Town Hill coal taking fire since that time?—Yes, and before.

559. You have no reason to suppose that those cargoes were loaded in bad weather, or that the coals were saturated with wet?—I was in Dundee when the "Robert Gilroy" was loaded. She was loaded before the "Lochee." The coals which she shipped were very similar to those shipped by the "Lochee."

560. Were they loaded in the roads by lighters?—She took the greater part in in the dock, and finished loading in the river.

561. Was it very wet weather?—It was wet weather. She had a full cargo.

562. Those coals were brought from Fifeshire?—From the Town Hill colliery, the same colliery.

563. You have heard of other cases of this Town Hill coal burning where there was no reason to believe that the coal was saturated with moisture?—Yes; I have heard of several where the vessel has been destroyed having shipped the same coals, but I never took any interest in it till I was burnt out myself.

564. Have you any knowledge whether in the case of any of those ships that were burnt the coals were shipped dry?—In 1847 I went to Aden in the "Alexander," belonging to Dundee, and we took 1,000 tons of coal off Tay port in the month of May in dry weather, and no casualty happened in that case.

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565. Were they Town Hill coals?—They were shipped at Tay port. I could not tell which colliery they came from. Those coals in 1847 went perfectly safe to Aden.

566. Do you remember what coal a ship which went out not long ago belonging to Messrs. Gilmore, Rankin, and Strahan was loaded with?—I could not say.

567. (*Mr. Ferguson.*) Previous to the explosion in your vessel how long had the hatches been on?—The hatches were off every day during the voyage. They were never battened down till the ship took fire. We never had occasion to close the hatches on account of sea. We merely put them on to keep out the rain and spray, covered with a tarpaulin, and tacked down in windy weather to prevent it being blown off, but they were never battened down.

568. You had them off nearly every day?—The hatches were lifted off the first thing every morning.

569. Were they off at the time of the explosion?—They were battened down then; that was to let the fire smoulder out, to keep it from spreading.

570. What mode of ventilation did you adopt?—There were several ventilators 12 feet apart, fore and aft, and in the main hatchway we had a ventilator at each corner.

571. Did those ventilators come up above the hatchway, or were they beneath the surface of the hatchway covers when the hatchway covers were on?—They were vertical ventilators made of wood.

572. Did they come up through the hatchway?—Only up to within 2 or 3 feet of the main deck.

573. Had the ship a permanent ventilator?—Yes. The ship was very well ventilated in that way, but I sealed her up tight when there was an indication of heating. This ventilation in the main hatch came up just under the hatch.

574. Was she an iron ship?—No, a wooden ship.

575. (*Mr. Abel.*) How long previous to the explosion had you any indication that there was anything wrong?—It was only 24 hours before she exploded that we had any knowledge of what was going on.

576. Then you found considerable indications of fire?—No, there were no indications of fire whatever till the morning before.

577. Do you remember any other case in which you noticed heating in a cargo of coal?—No. I never saw any heating in a coal cargo before in my experience.

578. (*Mr. Icely.*) You said just now that you lowered the thermometer into the hold when you discovered that the cargo was becoming heated. Had you been in the habit previously of trying the temperature of the cargo?—No; I never tried the temperature before.

579. It was only when you felt that there was heat that you put down the thermometer?—When I saw that the coals had really taken fire, I wanted to ascertain where the fire was. There was no doubt that it was in the main hatch.

The witness withdrew.

Adjourned to Tuesday next at 12 oclock.

Tuesday, June 15th, 1875.

PRESENT:

THE RIGHT HONOURABLE HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

SIR GEORGE ELLIOT, Bart., M.P.
HENRY HUSSEY VIVIAN, Esq., M.P.
FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.,
JOHN PERCY, Esq., M.D., F.R.S.
WILLIAM YOUNG, Esq.

J. M. CARMICHAEL, Esq., Secretary.

MR. JAMES WRIGHT examined.

580. (*Chairman.*) You are engineer-in-chief to the Admiralty?—I am.

581. I believe you can give us some information about the cases of spontaneous combustion or explosion of coal which have occurred in Her Majesty's ships for some years past?—The papers generally

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pass through my hands, and I have looked up the records during the last seven years. So far as I can ascertain with any degree of exactness there have only been about five cases of spontaneous combustion, and two cases of explosion in men-of-war which were considered of sufficient importance to be reported during those seven years.

582. That is quite irrespective of ships chartered by the Admiralty to carry coal?—Quite irrespective of those.

583. Can you give the Commission the particulars of some or all of those cases?—Beginning in 1868 the first is the case of the "Euphrates" Indian troop ship. When nearing Bombay, shortly before midnight smoke was observed issuing from the starboard bunker. Fortunately there were only about 20 tons of coal in that part of the bunker. The fire was extinguished without any serious results. It was supposed to have been caused by the fact that some of the Spence's cement with which the boiler was covered had fallen off and an undue amount of heat had been communicated from the back of the boilers to the coal in the boxes. The kind of coal is not reported, but I believe it was Welsh coal.

584. That in the opinion of the Department was not a case of spontaneous combustion?—Not a case of spontaneous combustion.

585. But of communicated heat?—Yes.

586. What was the next case of which you have any particulars?—The next case was that of the "Megæra." In February 1870, on her passage from England to Ascension, the temperature in the wing bunkers was discovered to be rising from 130° to 145°, and it was considered necessary to clear part of the bunkers. They did so, and the coal was found to be considerably heated, but no damage of any importance was done. The coal in that case was the Hirwain Aberdare.

587. What was the view of the Department as to the cause of the casualty in that case?—The bunkers were reported to be well ventilated; the usual precautions had been taken to prevent overheating. It was supposed that heat had been communicated in that case to the coal, but that was proved not to be the case* as the boilers were well covered, and no steam pipes went through the boxes. It was one of those difficult cases in which you could not give any clear reason for the heating of the coal. The Hirwain Aberdare is supposed to be a hard coal of the nature of anthracite, rather more so than most of the other coals. No satisfactory cause, I think, was ever given.

588. Was there an inquiry?—Only the reports of the different officers upon the subject; it was inquired into as well as it could be, but nothing satisfactory came of it as far as I could ascertain.

589. You were then at the Admiralty?—Yes.

590. You could not arrive at any satisfactory conclusion?—No.

591. What was the next case?—The next case was the "Malabar" Indian troop ship. In February 1872, on her passage to Bombay, a strong smell of sulphur was observed by the men working at the boilers, on both sides at the same time. The bunkers were immediately cleared, and all ventilation stopped. The doors in the after end of the stokehold were opened, and the coal taken out as fast as possible. Much of it was found to be smouldering and heated, and only requiring a little air to burst into flame. It was necessary to flood the boxes entirely to put out the fire. The coal had been received from under cover at Malta only 16 days before, and was perfectly dry and apparently well mixed. It consisted of one half Cowpen Hartley received at Malta in April 1871, and one half Fothergills Aberdare received at Malta in September 1871. The test-tubes did not show any sign of the heat before the discovery, and afterwards they never showed more than 110°, which is very little above the usual temperature in the Red Sea.

592. What conclusion did you come to in that case?—No decided conclusion was come to in that case either.

593. The coal was put on board perfectly dry?—The coal was put on board perfectly dry, in good condition, and well mixed.

594. There was no reason to believe that the casualty arose from any external cause?—Not in that case.

595. (*Mr. Vivian.*) That was the coal in the bunkers?—Yes.

596. (*Chairman.*) What is the next case?—The next case was that of the "Glasgow" on the East Indian Station. On the 22nd of June 1872 it was discovered that there was a heating of the coals in the starboard aft coal bunker. It was found that the greatest heat was about 6 feet down, and about 4 feet from the side athwart ships. The coal there was found to be at a temperature of about 135°. The coal was received on board perfectly dry, and in fine weather. The coal had been received at Aden, Bombay, and Trincomalee. It had been received on board in small quantities at those places. It consisted of Davis's Merthyr, Davidson's West Hartley, Tyne fine Merthyr, Cowpen Hartley. The greater part of it was Welsh coal; it would probably be three-fourths Welsh and one-fourth of it North-country. There was no damage done in that case, and no clear reason was assigned for the heating of the coal.

597. What was the next case?—The next case was the "Rattlesnake" on the coast of Africa. On the 20th of February 1872 smoke was discovered to be issuing from the bunkers at the back of the starboard boilers. On removing about 20 tons some discoloured coal was found. Precautions were taken to stow the coals quite dry. The coal was observed to contain a large quantity of sulphur and iron pyrites; that was the report of the officer. I suppose it would be sulphide of iron.

598. In that case did you form any judgment as to the cause of the heating of the coals?—No.

599. What coal was it in that case?—It was entirely Cowpen Hartley.

600. In the two other cases, the "Malabar" and the "Glasgow," there was also some Cowpen Hartley on board?—In small quantities.

601. (*Chairman.*) Will you go to the next case?—The next case was the "Daphne," on October 11th, 1874. She was lying at Trincomalee. One lid of the port aft bunker and one lid of the starboard aft bunkers were blown off, and a flash of flame was observed. Smoke was then seen ascending. In shovelling out the coal a stoker came across a small portion of burning coal. The pumps were then used, and the fire was extinguished. The temperature of the bunkers before the occurrence, close to the seat of the fire, was not beyond the usual average. Starboard the temperature was 92° and port it was 95°. The main steam pipe passes through the port bunkers so that its temperature is rather higher than starboard when the ship is under steam. The coal was two thirds Nixon's Navigation and one third Davison's West Hartley. It was shipped at Aden in a perfectly dry state. It also appeared dry on the 11th of October. It afterwards transpired that the bunker lids on those coal boxes had not been removed for some time previous to the fire, contrary to regulations. It was supposed at first that the casualty was caused by an explosion of gas which had communicated the fire to the coal.

602. Was there any special inquiry in that case?—There was an inquiry by the Commander-in-Chief.

603. Do you know by whom it was conducted?—The Commander-in-Chief made the inquiry personally, I think.

604. What was his opinion?—His opinion was that it was through not ventilating the coal boxes sufficiently.

605. Did you concur in that?—So far as we could see there did not appear to be any other reason assignable for it. Those are the cases of coal taking fire. The only two cases resulting from explosion of gas occurred in the "Devastation" and the "Minotaur."

* *See* Admiralty Papers, page 62, which confirm this statement, and show that Mr. McCulloch in his replies, No. 729 and 730, was mistaken.

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In the "Devastation" in June 1874, the ship's cook's assistant very early in the morning entered the bunkers with a naked light and an explosion of gas took place.

606. Was any mischief done?—There was no mischief done except that the man was burnt somewhat about the face and neck; the bunkers lid had been removed two days before, so that the gas must have been generated during the interval.

607. Was anything done to the coal afterwards?—No, the coal was all examined. No increase of temperature was found to have been caused, and there was no appearance of any heating in the coal.

608. What description of coal was that?—Welsh. ⅔ Fothergill's Aberdare and Insole's Merthyr, I think, and ⅓ Cowpen Hartley.

609. What was the date at which the coal was received, and how long before that date had it come away from the colliery?—The coal had been shipped at Portland six days before. The bunkers was nearly full; there was no indication of heat or damp; the temperature was 66°, and the explosion was confined to the neighbourhood of the aperture.

610. The "Devastation" was one of the Channel fleet?—She was lying at Portsmouth at the time.

611. The "Devastation," while in the Channel fleet, received nothing but Welsh coal?—It was mostly Welsh, but mixed as before mentioned in the bunker where the explosion occurred.

612. The other case of explosion was the case of the "Minotaur?"—Yes, in June 1869. There then was a slight explosion of gas in the starboard aft bunker opening into the shell compartment. On a light being lowered into the bunker for the purpose of examination it was blown out by the rush of gas, and there was a slight explosion, but no harm done—nobody was injured.

613. Was the coal turned over afterwards?—The coal was examined and it was found that there was no heating; the temperature in the forward bunker was 71°, and in the aft bunkers 68°.

614. What coal was that?—A mixture of several kinds of Welsh and north country received on board at various times during the previous nine months. The last supply was received at Lisbon in May 1869, it was on the top of the other coal, and consisted of Dowlan's Merthyr, Ocean Merthyr, Powell's Duffryn, Hastings Hartley, and Cowpen Hartley; exact proportions not recorded.

615. Those are all the causes of spontaneous combustion or explosion which have occurred in the navy for some time past?—They are all the cases that appear to have been considered worth reporting to the Admiralty within the last seven years.

616. Can you tell the Commission what precautions are taken in the navy to guard against over heating and to detect any rise of temperature?—There is an old standing order that the wood work of all coal boxes is to be lined with sheet iron and the Captains are to see that the coals are never shipped wet. They are to see that they are kept as dry as possible on board, and when a fresh supply is received they are to cause as much of the old coal as possible to be trimmed forward so that it may be used first, and they are to cause the temperature of the coal to be taken through the temperature tubes every watch, and recorded. In all large ships, at least, the coal boxes are placed from 16 to 18 inches from the boilers, and means are taken to create a current of air between the coal boxes and the boilers. The boilers are covered with four thicknesses of boiler felt to prevent radiation of heat. There is a standing order also that the coal boxes shall be ventilated by the bunker lids being removed occasionally. And lately, about a year ago, a general order was issued that in all ships some means of ventilation should be provided for carrying off any gas that might be generated in the coal boxes. The general plan is to lead some light iron pipes from the upper part of the coal boxes to the nearest funnel casing.

617. Have you noticed of late years, say within the last two of three years since the great rise in the price of coal, any increase in the number of cases of spontaneous combustion?—I think not. Of late years there has been no difference. There were rather more cases between 1871 and 1873 than we have had the last two years.

618. To what do you attribute that?—I cannot give any reason for it.

619. At any rate in 1873 and 1874, when, undoubtedly the number of casualties in coal-carrying ships was much greater, there was no corresponding increase in the number of casualties in the navy?—No.

620. (*Mr. Icely.*) There was a case of spontaneous combustion of coal in a store at Jamaica some years ago. Have you the particulars of that case?—That was in September 1872. The coal was stored in a brick or stone-built building, I cannot say which, and it was roofed with corrugated zinc. The coal was Cowpen Hartley, and had been landed in April 1872. The temperature under the store was generally about 97°. The coal was discovered to be hot, and they removed about 240 tons. It was reported by the officer there that the coal appeared to contain a considerable quantity of sulphur and iron. There was no cause assigned for the heating further than that. There was no serious damage done. The coal was slightly charred and injured, but there was no serious damage.

621. Are there any means taken to ascertain the temperature in the Government stores from time to time?—I do not know that any special means are taken to ascertain the temperature in stores on shore; but a system of ventilation is carried out by louvres over the top in some cases, and in other cases by side louvres all along; but as regards the taking of the temperature, I do not think there are any distinct orders upon the subject.

622. Was there any evidence as to how the fire, or the heating of the coal was first discovered in the store at Jamaica?—That is not stated in the report. The report simply says that the coal was discovered to be hot.

623. Do you attribute the immunity which the vessels in the navy appear to enjoy from this tendency to spontaneous combustion of coal to the fact of the temperature being regularly taken, and to those orders of the Admiralty to which you have referred being carried out?—I should think that would be one great reason for it. By reason of the discipline on board a man-of-war, and by the temperature being regularly taken in that way, a fire is prevented from getting ahead to any extent before it is discovered. It is rather strange that in two of the cases which I have mentioned, the thermometer on being lowered in the temperature tubes did not show any unusual rise. The fire or heating seemed to be confined to a very small space. It was first discovered from the smoke or sulphurous fumes coming up the boxes, not from the indications of the thermometer.

624. Have you in any of the cases any information about any rise of temperature having taken place; for instance, is there any statement that the thermometer was lowered at a certain time and gave you a certain number of degrees, and that it was lowered at another period, an hour or so after, and that it showed an increase in the temperature during that period, so as to indicate whether the heating took place rapidly or not?—No, I do not think that in any of these reports that has been recorded, for in most cases as soon as they discovered that the temperature was high they took means immediately to get at the seat of the heat, so that they did not wait to take the temperature subsequently. In all these cases I think they did not wait to record the gradual increase of the temperature.

624*a*. At present those tubes are plain. Do you think if they were perforated they would show indications of heating in the coal more readily?—They would show those indications more readily no doubt, because there would then possibly be a current towards the tube. However, I believe it is a question with some people whether it is right to ventilate coal-boxes much or not.

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625. Are you in favour of the ventilation of coal-boxes?—We are in favour of the ventilation of coal-boxes, so much so, that an order has been given to ventilate coal-boxes in ships of any kind, by means of these tubes leading to the funnel casings.

626. Those are outlets, but are inlets provided, or recommended?—No inlets, except what you get by removing the bunker lids, and opening the trimming doors.

627. Then would the air pass through the body of the coal?—Yes. Then when the coal was taken on board ship on most occasions the trimming doors would be open, which would give ventilation from below. The shoots in front of the trimming doors are generally free from coal, so that generally there would be a current there whenever the bunker lids or doors were open.

628. That is usually the case on board ship?—Yes.

629. An inlet is provided by that means?—Yes.

630. The exit would be through the funnel casing, where an active circulation would be kept up from the heat maintained there?—Yes.

631. (*Mr. Fenwick.*) In all those cases which you have given us, the coal appears to have been mixed coal?—It was mixed coal in most of the cases, but Welsh in the "Euphrates" and "Megæra," and north country in the "Rattlesnake." The report in that case only refers to Cowpen Hartley received at Sierra Leone.

632. It was only Cowpen Hartley in the "Rattlesnake"?—Yes, so I infer from the report.

633. Do the Admiralty take such coal as the market produces, or is the Admiralty in the habit of sending particular descriptions of coal direct to the particular ports?—I am not very well acquainted with the way in which the contracts are made at present; but I understand that Mr. Rowsell, the director of contracts, has been requested to give evidence, and he will be better able to tell you all those particulars than I am. I think the Admiralty contract, in most cases, direct with the mine owner to supply certain quantities of coal for certain stations; and the Admiralty are not at the risk of shipping them, they only receive the coals as they are sent over the ship's side, the coal owner, or the shipowner, taking all the risk; the Admiralty simply receive the coals at the stores. They order a cargo of Cowpen Hartley, or a cargo of Davisons, or a cargo of Welsh coal to be delivered at certain depôts by certain times.

634. (*Mr. Vivian.*) You have given us five cases of spontaneous combustion, namely, the "Megæra," the "Malabar," the "Glasgow," the "Rattlesnake," and the "Daphne"—Cowpen Hartley formed a portion of the cargo in four out of five of those cases—have you investigated the character of the Cowpen Hartley coal at all?—No, I have not. Samples of coal are generally tested in the coal testing boilers in the dock-yard, and, speaking from experiments that were made with it, I think as a steam producing coal it is about the best of the Hartley coals.

635. In view of the fact that in four out of the five cases Cowpen Hartley formed a portion of the cargo, you have not thought it necessary to examine it so as to see whether it contained much iron pyrites or not?—No.

636. In two cases it was reported to contain iron pyrites?—That was the statement in the report.

637. (*Mr. Duncan.*) As it is not customary to have in merchants' ships which carry coals these tubes for testing the temperature, perhaps you will be good enough to describe what those tubes are?—They are simply iron tubes fitted in the deck above the coal bunkers, 3 inches in diameter, having a moveable lid, and the tubes are long enough to reach to within about 2 feet of the bottom of the coal bunkers. You take off the lid and lower the thermometer by a string and leave it till you get the correct temperature of the region around. They are fitted at a distance of about 8 feet apart.

638. They have no holes perforated in them?—They have no holes perforated in them.

639. Unless the lower end was left open, they would be apt to get the small coal in them?—Yes; and if perforated round the sides the small coal would get through.

640. Those tubes come up through the deck?—Yes, so that you can lower the thermometer down them.

641. Have you any impression that the mixing of the coals is an injury, that is to say, the combining of different coals?—No, I have no opinion upon that subject. I have not seen anything to call particular attention to it.

642. Some ship owners object to carry mixed coals having the impression that the mixing of coals is calculated to cause spontaneous ignition?—There is at present a standing order at the Admiralty that mixed coals should be used in the navy in proportion of two-thirds Welsh and one-third north country on most of the stations, and that the coals should be mixed on board, that two bags of Welsh and one of north country shall be put in the bunker alternately.

643. The fair inference from that is, that the Admiralty have no idea that mixing has any effect at all in causing spontaneous combustion?—Quite so.

644. (*Mr. Ferguson.*) Were those coal boxes in which the coals took fire nearest to the boilers?—At the back of the boilers, near the boilers, there was a space of about 16 inches in each case between the boilers and the coal box.

645. Was there a fire in the boiler in all the cases?—There was not in the "Devastation," "Minotaur," or "Daphne," I think.

646. It is not usual in merchant vessels to put the bunkers so far away back from the boilers. Six inches is about the distance in the case of old low-pressure boilers, but in the case of high-pressure boilers the distance apart is greater?—In the navy we keep them about the distance apart that I have mentioned, it is partly with the object of getting round the boilers to do any repairs, that distance gives sufficient space for a man to get between the coal box and the boilers. In some small vessels in the navy where the quantity of coal carried is necessarily small and the coal boxes are of small cubical capacity, we have been obliged to put them within about 6 inches of the boilers; in those cases the bulk of the coal is not large, and with the temperature tubes fitted we have had no reason to believe that there was any risk in putting the coal boxes so close to the boilers as 6 inches.

647. From the fact that the coals which took fire were so near the boiler, you would infer that the heat of the boilers affected them would you not?—In some cases the temperature tubes did not show any increase of heat. A little would be due to proximity to the boiler.

648. Are you aware whether, in merchant vessels, coals have become heated too near the boilers?—No, I am not acquainted with any such cases.

649. You said that you thought the navy was more free from cases of spontaneous combustion than merchant vessels?—I think so from the fact of precautions being taken to guard against danger and from the better discipline on board men of war.

650. Do you think the distance of the coal boxes from the boilers would have any share in it?—It would have something to do with it, no doubt.

651. (*Dr. Percy.*) You spoke of one case in which it was believed that fire had been communicated to the coal on account of the removal of the cement of the boiler. What temperature do you think would be communicated to the coal under these conditions?—I could hardly say; the temperature of the boiler itself would be between 260° and 270°, then there would be a space of 16 inches between the back of the boiler and the coal box, and the seat of the fire was about 4 feet in.

652. It was not on the outside that heat would be greatest?—No, but a little way in.

653. Is it the impression at the Admiralty that all coal when wet is more likely to fire than when dry?—That is the strong impression at the Admiralty.

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654. Can you adduce any facts in justification of that conclusion?—The only case I know of late years is a case of heating of coal that took place about a year ago in the Bermuda coal store.

655. Do you know whether that coal happened to contain much iron pyrites?—No, the report was that it was small coal taken into store when the atmosphere was moist.

656. No reference was made to the point of its containing iron pyrites?—No, I think not.

657. Is any really searching examination ever made at the Admiralty with a view of ascertaining the amount of iron pyrites in the coal which they consume, or the manner in which that iron pyrites is diffused through the coal, whether uniformly or in lumps?—I do not know of any such inquiry having been made.

658. In one case to which you referred you said that the fire was very local in that case. Was any examination made with a view to ascertain whether that part of the coal in which the firing took place contained more than the usual amount of iron pyrites?—That I think was the case of the "Daphne." In that case the report contained no statement that the coal appeared to contain more than the usual amount of iron pyrites.

659. No examination upon that point was made?—No special examination was made.

660. (*Mr. Abel.*) According to the regulations, the operation of mixing the coal is to be carried on during the loading of the coal on board ship?—That is so.

661. The different sorts of coal are shot into the bunkers alternately. A load of one coal is first shot in, and then one load of another coal?—Yes.

662. Has any note been taken as regards the mechanical condition of the coal in the bunkers in those cases of spontaneous combustion?—I think not.

663. No record exists as to whether the cargo appeared to be composed of small coal to a greater extent on some occasions than others?—The only case in which any reference was made to the smallness of the coal was that of the coal store in Bermuda. There the report mentioned that the coal was very small, and that it lay close together; and it was also stated that it was taken in when the atmosphere was moist.

664. (*Mr. Young.*) You have told us how the Jamaica store was built, do you know whether other stores elsewhere are of a similar description?—Some of them are built of brick, and others are built of iron.

665. Are they always covered?—In all cases, I think, they are covered I think all the foreign ones are covered.

666. What depth of coal is generally stored?—Various depths, from 5 or 6 feet to 12 feet.

667. The coal would not be so deep as in the hold of a large ship?—I think not. In some cases the coals are stored in building with brick walls and arches, and those would be from 10 to 12 feet deep; on the top of the arches there would be *louvres*, those arches would be about 10 feet wide and perhaps 12 feet deep running in long bays.

668. So that there would be a thorough draught?—There would be a good draught. In the coal store in Gibraltar, for instance, the back of the store is part of the rock, then there is an iron roof, and the sides are covered a certain way up, then perhaps there would be 4 or 5 feet comparatively open all round at the upper part of the sides.

669. You know of no case of combustion of coal in a store on shore, except the case at Jamaica?—I think there was a case at Woolwich about ten years ago, but I have no particulars of that case.

670. (*Chairman.*) Experiments with regard to mixing coal for the use of the navy have been going on for the last 12 or 15 years, more or less, have they not?—Yes.

671. Was one of the points kept in view in those experiments the liability of coal to fire?—No, that matter did not arise in the inquiry so far as I know.

672. You said that there was some difference of opinion whether ventilation promoted or prevented spontaneous combustion?—That is what I gather from people whom I heard discussing the question. Some are of opinion that it is not desirable to have much ventilation, the general opinion, however, is, I think, that it is desirable to have ventilation.

673. The view of the professional officers at the Admiralty is that it is desirable to have ventilation?—That it is desirable to have ventilation in the coal boxes on board ship.

674. Would you apply *à priori* the same to merchant ships carrying cargoes of coal?—I think so.

675. So far as the experience derived from what has taken place in the carriage of coal in bunkers in ships in the navy goes you think it points to the desirability of thorough ventilation rather than of no ventilation?—I think so.

676. But as to coal-carrying ships you have no personal experience?—I have no personal experience with regard to coal-carrying ships.

677. Can you give us any idea of the quantity of coal that is carried in the bunkers of a man-of war?—It varies from perhaps 20 tons to 300 tons, according to circumstances. In large iron vessels the coal bunkers are really water-tight compartments, local conditions regulate the quantity of coal carried in the different compartments. In some cases 200 tons would be carried in one compartment, in others 40, or 50.

678. (*Mr. Duncan.*) In a vessel like the "Euphrates," the compartments would carry more than 1,200 tons, would they not?—There are a great many compartments in the "Euphrates"; she would carry 1,200 tons altogether. In the after coal reserves she would carry perhaps 300 tons; then there would be 100 tons an each side of the engines; then there would be perhaps 200 tons on each side of the boilers, and then in another reserve, perhaps, she would carry 300 tons.

679. (*Chairman.*) About 300 tons would be the outside carrying capacity of any one of the compartments?—So far as I recollect at present that would be the outside capacity of any one of the compartments.

680. (*Mr. Vivian.*) In regard to the Bermuda store in which you stated the coals got heated about a year ago, what quantity of coal was in the store?—I cannot say; the report does not state the quantity.

681. What description of coal was it?—Baltimore coal. American coal. It is a small coal, something like our Welsh coal. It was used on the North-American station for mixing with Nova Scotian Pictou coal. Nova Scotian Pictou coal is of a bituminous nature, and it was supposed to burn better with a mixture of this Baltimore coal, but since that casualty orders have been given to discontinue the use of Baltimore coal.

682. (*Chairman.*) You call it Baltimore coal; that is to say it was shipped at Baltimore?—Yes.

683. It was a Pennsylvanian coal, was it not?—I believe so, and shipped at Baltimore.

684. (*Mr. Vivian.*) You have given us seven instances in which casualties have occurred in men of war. During the period that those casualties occurred, how many of Her Majesty's ships were in commission?—The number of steamships in commission would be 170 on the average during that time.

685. The number of years in which those casualities occurred was about seven?—Yes, the casualties would be about six-tenths per cent. per annum.

686. Rather more than half per cent. per annum?—Yes.

687. (*Mr. Icely.*) The seven cases include spontaneous combustions and explosions?—Yes, about that.

688. In the explosions little harm was done?—Very little; in fact there was no material damage done in any case.

689. (*Chairman.*) If you excluded the explosions, it would be half per cent. per annum?—Yes.

690. Will you give the Commission some information as to the manner in which coal is stored at home

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Mr. J. Wright.
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ports. Is it covered?—In most cases it is covered. At Portsmouth there is no coal store on shore, but there is a large one being built in connexion with the dockyard extension. Some of the coal is stored in the open air in the dockyard, and there are coal hulks and haulabouts that will contain altogether about 10,000 tons. At Devonport there is a store, I do not know the quantity it will contain, but there is an iron building there with openings round the eaves, and there are also coal hulks and haulabouts there.

691. And at Sheerness?—I do not think there is a coal store under cover there, most of the coal however is in hulks.

692. Have you known any instances in the last seven years of combustion in either of those three places?—I do not know of any case of spontaneous combustion having occurred in a coal hulk. With reference to the question, I was asked by Dr. Percy as to whether there was any inspection of coal for iron pyrites. I may mention that in the South Wales district and in the North Country district there is an inspector resident who is supposed to see that the coal shipped is of good quality and free from impurities.

693. (*Dr. Percy.*) All that he does is simply to inspect the coal?—That is all.

694. He does not make any chemical or other examination of the coals?—No.

The witness withdrew.

MR. HENRY JOHNSON MCCULLOCH examined:

Mr. H. J. McCulloch.

696. (*Chairman.*) In what capacity are you employed under the Admiralty?—I am consulting coal engineer to the Admiralty.

697. Have you been long connected with the coal trade?—More than 30 years.

698. Will you tell the Commission in what capacity?—I originally commenced my public life as a mining engineer. Then I was for 17 years consulting coal engineer to the Great Northern Railway, in which capacity I had to buy all their coals. Then I left them and became a viewer and consulting engineer on my own account, having under my charge several collieries in North Wales and other places, till I joined the Government seven years ago. In addition to that, I have been for 20 years, and am now, consulting coal engineer to the Madras Railway Company. I advise as to buying their coals, and inspect them, and ship them. I have sent out nearly 400,000 tons of coal and coke to Madras.

699. You have had 20 years' experience in shipping coal for the Madras railway, and six or seven years experience in shipping coal for the Government?—Yes.

700. Can you give the Commission any information as to cases of ignition of coal which have taken place in your experience since you have been connected with the Madras railway and with the Admiralty?—I have only had two cases of spontaneous combustion in shipping coals for the Madras Railway, and singularly enough they were in 1874. I never had a case before 1874.

701. Have you ever had any cases of ignition in shipping coal for the Government?—In shipping the hundreds and thousands of tons of coal for the Government, I have not known the case of a single ship in which spontaneous combustion has occurred, except one, though there have been two or three cases of spontaneous combustion in some of Her Majesty's ships.

702. That is to say, in the coal ships which have carried to foreign ports the coal which you have purchased for the Government, you have only had one case of ignition?—Only one case, and that was in English waters.

703. Will you state the particulars of those three cases to which you refer, two of them being shipments for the Madras Railway, and the other being a shipment for the Admiralty?—In the case of the shipment for the Admiralty the coal was shipped at Cardiff; there had been contrary winds, and the ship was boxing about, and when she was a little beyond the Scilly Islands she took fire.

704. What was the size of the ship?—She was about 800 tons.

705. How much coal had she on board?—About 800 tons.

706. She was full?—I think she was quite full; she was about 500 tons register.

707. Was any inquiry made into the circumstances of that casualty?—No; the men took to their boats; the ship was burnt, and went down.

708. When was that?—It was in 1872 or 1873.

709. Was no inquiry made afterwards into the circumstances?—I never heard of any particular inquiry; it did not come under my notice particularly, for this reason: we buy all our coals delivered at a port; we contract with colliery owners on this side, and we say, At what price will you deliver at Gibraltar? for instance, and they have to effect their own insurance, and find their own shipping, and everything. If they deliver the coal at that port they are paid for it.

710. So that it did not become the duty of the Admiralty to make any inquiry into the case?—No.

711. Did not the Admiralty take any interest in it with reference to the kind of coal purchased, so that it might be avoided if it was found to be liable to spontaneous combustion?—I do not believe that coal could ignite; the casualty must have been owing to something external to the coal itself.

712. What coal was it?—If I mistake not, it consisted of two kinds of South Wales coal, the exact denomination of which I am unable to give. It was shipped at Cardiff.

713. Now will you give the particulars of the two cases you mentioned of coals shipped for the Madras railway?—The first was the "Numea," which sailed from the Tyne on the 1st of May 1874; she had 1,530 tons of coal filled up. The coal was Cowpen Hartley coal. On the 14th of September (according to the official statement of the captain and the notary), when they were near Madras, they observed smoke coming out of the hatches and they immediately proceeded to endeavour to ascertain the cause of it, and they found that the coals, though not in flame or even red hot, were very hot; they poured water on them, and got into harbour without much damage. I investigated that matter thoroughly myself, and I found the reason of the casualty to be what I should have suspected, namely, that water had got into the hold and the coals had become wet.

714. Water had got into the hold on the voyage?—Yes.

715. The coal was shipped dry?—Yes, in the usual way; I suppose it was perfectly dry when shipped.

716. Was the evidence conclusive that water had got in?—Perfectly conclusive.

717. Was there any iron pyrites in the coal?—It is very free from sulphur; it is one of the best coals in the Tyne. There are four or five of about equal value, but I believe it is the freest from sulphur of any one of them, or as free.

718. Passing to the other case, what was that?—The other case was the "Palmyra," which sailed from Liverpool on the 17th June 1874 with 1,206 tons fully loaded.

719. With what coals?—Pearson and Knowles's Wigan Hartley. On the 17th of September, after having had rather a rough passage, they saw smoke issuing from the hatchways; they took the main hatch off, and discovered that the smoke was coming rapidly up, and to all appearance the coal was on fire. They immediately got the donkey engine to work (according to the report which was vouched for in the usual way), and they poured many tons of water on the fire, and then strove to get the coals out. They got about 18 tons of coals out and mastered the fire.

720. What was supposed to be the cause of that?—In investigating that, I found likewise that they had got a lot of water in.

721. That was the captain's explanation, was it?—

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He did not seem to want to explain it that way, but I found it out simply by putting certain questions to him and the mates. I felt perfectly sure that unless some unaccountable action had taken place it must have been from water getting in.

722. There was nothing peculiar about the state of the coal when shipped?—Nothing, I saw it shipped, it was shipped at a high level.

723. How many feet did it fall?—The high level is 30 or 40 feet above the quay side, and then they have a crane on the top; they take hold of the wagon and lower it down to about the level of the bulwarks of the ship, and then they take the end of the wagon out, and the coal goes into the hold; the first fall would be, I should think, probably about 26 feet.

724. Then in all your experiences those are the only three cases of coal taking fire spontaneously which you have been concerned with?—Yes, that is so.

725. How many cases of shipments of coal altogether have you been concerned with for the Government, and for the Madras company, speaking roughly?—Several thousands.

726. Therefore the per-centage of cases with which you are acquainted is very small indeed?—Very small indeed.

727. From your connexion with the Admiralty, do you know of any cases of spontaneous combustion in Her Majesty's ships, the coal for use in which you have been concerned in buying?—Only two cases, the "Rattlesnake" and the "Racoon."

728. Were those cases referred to you for report?—The papers came round to me in the usual way.

*729. What were those cases?—They were very slight, the firing took place in the bunkers. I have no hesitation in saying as I said on the minute, that those cases entirely arose from the heat of the boilers, and perhaps a little water had got in. I forgot the "Megæra," that was another case; that was a plain case where a steam pipe went through the coals.

730. That was a clear case of heating from external causes?—A clear case, and the others were I believe the same. A tremendous heat would be caused, and the slightest moisture would assist the action and cause the coal to break into flame.

731. You stated the method in which the coal was shipped in one particular case for the Madras company, are you well acquainted with the way in which coal is shipped at various ports?—I think I am acquainted with the mode in which coal is shipped in every port of Great Britain.

732. How many different ways of shipping coal are there?—A dozen, or more than that.

733. Will you describe the principal methods of shipment?—The best method of shipment of all is that which is adopted on the river Tyne, and at Blyth, and Sunderlands. There they have two methods. The best one of all I will describe first. The waggon comes on to the top of the drops, which are perhaps 40 or 50 feet above the water, the bottom of the waggon is loose, hanging on a hinge on one side, there being two hasps on the other. There is a long telescope spout, and at the bottom of the spout, or near the middle of it, there is a trap to hold a waggon of coals. When they knock out the bottom of the waggon the coals fall out of the waggon close on to the screen, perhaps within 18 inches of it. The coal falls and runs down the incline of the screen until it meets this trap. Then the ship being empty, or thereabouts, they have a large tub that will hold about two tons of coal, a large iron tub worked by a crane, either by steam, or by hydraulic pressure; they lower that down and put it under the spout. They can, if they like, make the spout reach down to the deck, or close on to the hatchway, but in this case they do not do that; they put the tub under the spout, open the trap, and fill the tub. The tub, when filled, is lowered right down to the bottom of the hold. It has a trap at the bottom, and the man who goes down with it just draws out a pin, and the bottom falls out and delivers its coal without any breakage.

734. That you consider the best method of shipping coals?—Yes.

735. Why?—Because it does not break the coals at all. The larger the coals the greater their value, and the less danger there is from fire. Then, when the coal comes up nearly to the top, they lower the spout down—I said before that the spout was a telescope,—and they run the lower part of the spout on to the deck; then they have a piece of sheet iron close to the deck, forming an acute angle, and the coals as they fall on this piece of sheet iron run down on each side, and the trimmers take them away on each side, right and left.

736. That, you consider is the best method of shipping coal, and spoils it the least?—I do.

737. Will you give us two or three other methods?—Then there is another method in use in those three places, which is by what they call swing drops. That method is adopted in the Tyne and Sunderland, but not in Blyth. They have a drop made with arms, on to which the waggon runs; and there is a counter-balance just to balance the weight of the waggon when the waggon was empty, so that when the coal was out of the waggon the counter-balance would bring the waggon up to bank again. They have a wheel and a break on it, and when a full waggon comes on, it goes down by its own gravity, and to hinder it from going down too quickly there is a man who has a break, and he applies the break sufficiently to let the waggon lower itself down gently till it gets down as far as the swing will allow it in its curve to go. Then, when it gets there, the same process takes place as in the case of the tub, they take out the pins and take out the bottom of the waggon, and the coal drops right into the hold, but it is close on the top.

738. That you consider a safe and effectual method of shipping coals?—I prefer the other, infinitely, but still it is the second-best method.

739. Will you give us one or two more?—In some places, in South Wales and in other places, of course they have nothing but the screen. They have a tip, but that tip is about 8 or 10 feet from the top of the deck; in some instances 6 feet, and all the coal must fall down that distance into the hold.

740. Is that the usual method adopted in South Wales?—Yes.

741. Do you consider that, with regard to the point which this Commission is specially looking into, it is safer and more advantageous to shoot coal according to the first method you have mentioned?—I do, and I will show you why I think so. Small coal falling into a ship becomes compact and dense, and therefore more capable of excluding anything like air. The more crevices that are left between the pieces of coal, the better it is, and the more opportunity there is for the air to circulate around the coal. Of course it is the want of air in my opinion that causes the combustion.

742. You consider that the better the coal is ventilated the less likely is combustion to take place?—Yes.

743. Will you give us some information also about the transport of the coal from the pit to the place of shipment. Has there been of late years much change in point of time in the transit from the pit to the place of shipment, or in any other respect?—Within the last 15 or 20 years there has been a great gain in the time of the transit from the colliery to the staith, but I am not quite so sure whether that has not been counterbalanced by the immense exportation. For instance, 20 or 25 years ago they were all small waggons that were used, what we call chaldron waggons, but of late years we have had 10-ton waggons. The larger the quantity in the waggon, the worse for the coal, in my opinion.

744. Do you think that the employment of large waggons increases the risk of combustion?—It breaks the coal more.

745. The coal is not now so long exposed to the air as it used to be?—Perhaps not.

* *See* Admiralty Inquiry, page 62, which shows that Mr. McCulloch, in this, and in his next answer, was mistaken.

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Mr. H. J. McCulloch.

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746. In that respect is there a gain or a loss?—A gain, I think.

747. It is not so long exposed to moisture?—It is not so long exposed to moisture.

748. Going generally into the question referred to the Commission, what do you conceive to be the principal causes of spontaneous combustion of coal in coal-laden ships?—I look upon it that there is only one thing that can properly account for it. Very often I have seen coals put on board ship in a most lubberly way; that is to say, I have known the sides of the ship to be wet and damp, and sometimes I have even known water to be in the ship, quite apart from any moisture in the coals themselves, and my experience teaches me this, that if coals are even moist, much less damp, the bi-sulphide in the coals (because all coals have it, saving perhaps the hard coal of South Wales, the anthracite coal; except that coal I know of no coal that is free from sulphur) becomes, through its oxidization, turned into sulphide of iron by a natural process, and during that time, naturally, sufficient caloric is generated to cause combustion in the carbon of the coal.

749. Your opinion is that all spontaneous combustion of coal is caused by moisture, and that all coal is liable to spontaneous combustion?—More or less, except anthracite.

750. You do not believe that perfectly dry coal ever takes fire spontaneously?—I do not believe it.

751. Do you think that the number of cases of spontaneous combustion has been greater in the last two years than it was before?—Yes, I believe so.

752. The only two cases you have mentioned as having occurred within your own experience were last year?—They were last year.

753. How do you account for that?—It is partly to be accounted for, I think, by the immense increase in our exports. They have increased marvellously, and of course as the number of ships increase, the number of cases of spontaneous combustion would be likely to increase in the same ratio; but my impression is that there is a great deal of carelessness in the shipping of coal, and that there is no means of ventilation.

754. Do you think that there has been greater carelessness of late years?—I believe so.

755. Have you any evidence of that?—It is only an impression; more ships have taken fire within the last 10 years than perhaps in the century before.

756. You say that there has been greater carelessness, and also less attention to ventilation; do you believe that in a given number of ships there are fewer that are well ventilated than there used to be?—I do not think there are any ships that are ventilated; or if they are, they are so badly ventilated that the ventilation is not worth speaking of.

757. Your impression is that coal-laden ships are not, as a rule, well ventilated?—I think they are not well ventilated. I may say that they are not ventilated at all.

758. Do you say that absolutely as to all of them, or as to the great majority?—The great majority of them come under my own observation, and I have also seen many that I have had nothing to do with. I happened to be in Liverpool some two or three years ago, and I was talking to a shipowner who was there, and expressing my views as to ventilation. He misunderstood what I said to him on the matter evidently, because he went and had his ship ventilated, but instead of making the uprights as I advised him, and the trunk as well, he bored holes in his ventilator, and when the coals went in, the small coals went into the holes, and stopped all the ventilation.

759. What in your opinion are the precautions which should be taken, and which are not taken now, to prevent the spontaneous combustion of coals in coal-laden ships?—I think the remedy is very simple. From the deck I would put in a ventilator, of a size varying according to the size of the ship, in the forward part of the ship, so as always to be open to the breeze. I would carry that down into a large horizontal ventilator below, that would run the whole length of the ship; and at intervals, according to the size of the ship, I would place upright shafts 8 or 10 inches square, with louvres, so that, supposing they were 20 feet apart, if the coals were to heat even from damp of course the heat would always ascend, and it would come into these louvres because they would be all open; it would come right up through the body of the coal, and it would escape, and so keep the coal comparatively cool. This would go through the hatchways into the open air. That would not cost much, and any impression is that it would be a perfect preventative of heating.

760. You have stated already that in respect of ventilation coal-laden ships are deficient; would you impose upon them the necessity of adopting some such system as you recommend, by law?—Yes, and it would save their pockets. Whether the ventilation is made of wood or iron, I do not care. Some may fancy that to make the ventilation of wood would be adding fuel to flame, but I do not think so, because I believe it would keep the ship perfectly free from danger.

761. Have you any suggestions to make as to the best method of extinguishing fire on board coal-laden ships?—I see no other method but the old-fashioned one of water. If you could hermetically seal the bulkheads and the hatchways, we could find a very speedy way of extinguishing it with carbonic acid, but I think it is impossible practically to do so.

762. You mean with the extincteur?—Yes.

763. (*Mr. Vivian.*) What is the form of the waggons which are used on the Tyne, are they not conical at the bottom?—No, as a rule the bottoms are flat.

764. Do not the sides slope to the centre?—Yes.

765. And the ends slope to the centre?—Yes.

766. So that they are conical?—If you turn them upside down they are. When I speak of a conical waggon I mean a waggon in which they have a cone in the bottom.

767. I mean the sides and the ends slope towards the centre?—That is so as regards some of the waggons.

768. All the waggons are so constructed, are they not?—Not half of them.

769. Then how can the bottom clear the axle-trees?—It is in between them.

770. There are two classes of waggons on the Tyne, namely, end-board waggons and bottom-board waggons?—Yes.

771. I understood you to speak entirely of bottom-board waggons?—No; I said they tipped the waggons up at the end as well.

772. I understood that to refer to another species of tipping. Speaking of the Tyne mode of tipping, which you say you believe to be the best, the ends and sides of the waggons fall towards the centre?—Yes.

773. Then those waggons may be called inverted cones?—Yes.

774. You are acquainted with the South Wales coals, no doubt; is it possible to ship South Wales coals with waggons of that character?—Yes.

775. Have you ever seen it done?—No, because there are no waggons of that class in South Wales.

776. The blocks of South Wales coals are very large, are they not?—Yes.

777. Can you state, of your own knowledge, that they would pass through the bottom of those conical waggons?—I think they would.

778. Have you ever known them do so?—No, because there are no conical waggons in South Wales. But I have seen this done; I have seen large blocks of splint coal come out of those waggons, some of them 2 feet long by 15 or 18 inches thick, readily. A piece of coal may stick a little, but the men are prepared with what they call a prod, and they ease the piece of coal, and away it comes.

779. You have no practical experience leading you to say that it is practicable to ship South Wales coals in those conical waggons?—No, because I never saw a conical waggon in South Wales.

780. With regard to swing drops. You have seen

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them only on the Tyne, but are you aware that there are swing drops also in use in South Wales?—There are some at Swansea now.

781. And have been for a good many years?—Yes, at Swansea.

782. There are none at Cardiff?—I think none.

783. At Cardiff end-board waggons are used entirely?—They are all end-board waggons there.

784. The system is to drop the end of the waggon and let it discharge itself on to the shoot, is it not?—Yes.

785. Then in what does that differ from the Newcastle system?—Only in the delivery from the shoot into the hold.

786. In what does it differ from the swing-drop system that you said you have seen in use at Sunderland?—Somehow or other they do not bring their swing drops in South Wales sufficiently low down.

787. Do not they bring them simply to that angle at which the coal will run down?—The waggons are not used in this way in the swing drops that you are speaking about.

788. In what way does the swing drop of the Tyne and the Wear differ from the lowering drop used at Cardiff and Swansea?—The one goes so much lower on to the deck than the other.

789. The end of the shoot goes equally on to the deck in both cases, does it not?—In the swing drop there is no shoot used at all.

790. Then how do you double screen into the ship?—I think that is obsolete; at least, I hope it is. It is obsolete as far as the Admiralty is concerned. I tried to stop that waste of coal (beside the cost of 1*s.* more per ton) very soon after I took office.

791. You disapprove of the system of double screening?—Decidedly; it makes the coal worse, and is expensive.

792. The system adopted at Cardiff and other South Wales ports is to have the waggon and the shoot only at such an angle as to enable the coal to run, is it not?—That is the principal way.

793. So that it is subjected to no more pressure than is necessary to cause it to run?—Just so.

794. Is there not a check-board across the shoot to prevent its running down too quickly?—Yes, there is a trap.

795. Are you acquainted with the system of shipping coal at Swansea?—Yes.

796. Do you know the box system?—Yes.

797. You did not mention that?—No; because the box system is like the tub system, only more clumsy.

798. That is an entirley new system, adopted by the Great Western Railway, and worked by hydraulic power arranged by Sir William Armstrong?—Yes.

799. Those boxes lower the coal through the hatchways into the hold of ship?—Some of them do.

800. The bulk of them do?—Yes.

801. In what way is the Newcastle system better than that system?—In the first place, the tub in the one case holds so much more than the box; in the next place, the system is adopted at Swansea to a very limited extent only.

802. You said that the tub held two tons?—Two or three, or four tons.

803. The limit is the size of the hatchway?—Yes.

804. The South Wales tubs are as large as the hatchway will take, are they not?—They are like boxes. The Newcastle tubs are iron tubs.

805. The Swansea box would hold two and a half tons, would they not?—Yes.

806. That box is lowered through the hatchway into the hold?—Yes.

807. And the bottom of the box is struck out?—Yes.

808. Is not that a good system?—It is a good system, but it is only adopted to a limited extent.

809. Is not there this advantage in that system over the Newcastle system, that it saves one breakage of the coal? In the Newcastle system the coal has to be discharged from the truck into the shoot, and then from the shoot into the tub; whereas, in the South Wales system, the coal comes direct from the colliery in the box, and that box is lowered into the hold of the ship, so that there is one breakage less?—If you look at the coal which is shipped by that method, you will find that it is the soft coals; none of the best steam coals are shipped from South Wales in that way.

810. Was not the whole of the coal on the Vale of Neath system worked in that way?—No; at all events it is not so now; the tubs are in existence, but they are principally used for this soft coal.

811. Do you find generally that the coal shipped on the Tyne is discharged in better condition than the coal shipped in South Wales?—No, I would not say that, for the simple reason that the best steam coals in South Wales are so large that they come out larger than north country coals; but taking the coal all round, they come out with a less per-centage of small in the north country than in South Wales.

812. Do you think it would be desirable that the system of shipping coals adopted in the north of England should be introduced into South Wales ports?—I do.

813. Do you know the system adopted at the Alexandra Docks at Newport?—I do not know it. I saw the docks opened, but I did not go round to look at the drops. I believe they are on the same principle as the drops in the Tyne and the Wear.

814. The system adopted at the Alexandra Docks is considered to be the very best system of shipping coals that can be adopted, is it not?—I believe it is precisely the same in principle as that adopted in the Tyne.

815. You approve of the plan of lowering a tub containing the coal down through the hatchways?—Yes.

816. Till a column is formed?—Yes.

817. And then lowering the waggon down to the hatchways and discharging it as gently as possible?—Yes? the tub will lower the coal till it comes right up to the hatches, and there will be sufficient room on each side for the coals discharged on to the piece of sheet iron to slip away to each end where the trimmers can get hold of them.

818. You said that all coal contains iron pyrites. Some coal is what they call white ash coal, is it not?—All the best bituminous steam coal is white ash coal.

819. Is it possible that that can contain iron pyrites?—In my opinion it does.

820. Supposing it to contain iron pyrites, what becomes of the iron when burnt?—I daresay chemists would find it somewhere. I am not a chemist, but I have seen certain things take place, and I have drawn my own conclusions from them. It may not be in the form of iron pyrites, it may be in the form of sulphur. Iron pyrites may exist in the coal, and not be in the form of brass. Brass is usually the form of pyrites in North and South Wales, but there is sulphur in the coal, though there may not be the brassy appearance.

821. It must be in the condition of pyrites, must it not?—Of course it would be pyrites, but it would be in such a form that perhaps you would not find it. I can only say that the best steam coals in the north country go to white ash, and that I can positively say, because I have stood by a chemist when he has been analysing them. I can positively say that there was iron pyrites in those coals, and yet I could not distinguish it. A chemist might distinguish the presence of a small quantity of iron pyrites, though I could not.

822. Iron pyrites when burnt must produce oxide of iron in the first instance which would produce a red ash?—Suppose you had ·50 or ·60 of iron pyrites, how would you distinguish it?

823. The quantity is so infinitesimally small, that it may be disregarded?—No. Though the quantity of it in the coal may be so small, if the coal is made wet it will do its work. I would not buy a single coal if I had my own way that contained over 1 per cent. of iron pyrites, that is to say, for certain purposes.

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Mr. H. J. McCulloch.

15 June 1875.

According to our investigations we have never found in the best Welsh coals more than 1·20 to 1·50.

824. Is that sulphur or iron pyrites?—Iron pyrites. It is the same thing.

825. Iron pyrites is sulphur combined with iron, and sulphur is sulphur alone, is it not?—But they are in close brotherhood.

826. You consider that all coal contains iron pyrites?—Yes.

827. And that all coal is liable to spontaneous combustion if it is wetted?—I think so, save and except anthracite coal.

828. If anthracite coal contained iron pyrites, would not that be liable to ignite spontaneously?—Some of it does not contain any, some of it is nearly pure; and, besides, it is like stone.

829. Are you aware that anthracite comes from the same veins as the steam coal, only more to the westward?—I am perfectly aware of that, but there is a distinct difference in the strata.

830. In what respect is there a difference in the strata?—You will find a great difference between the steam coal and the anthracite. As you go north from the Aberdare Valley the coal becomes more and more anthracitical all the way up till you get right over the mountain.

831. In what way do the strata differ?—I mean the superincumbent strata. If you were sinking a pit higher up, you would find the strata different to what you would if you were sinking to the 4-feet seam lower down the valley.

832. (*Mr. Cory.*) I understood you to say that the Cowpen Hartley was more free from sulphur than any of the other Tyne coal?—I said three or four of the best coals were about on a par.

833. You did not intend to say that Cowpen was more free from sulphur than any of the rest?—No. I qualified that by saying there were three or four equally good.

834. Did you ever know of any ship ventilated on your plan?—One has gone out to Madras from Liverpool a little while ago ventilated in that way.

835. Exactly upon your plan?—Not exactly, but an imitation of it. It was not exactly carried out as I should have liked to see it done.

836. Is she a coal-laden ship?—Entirely a coal-laden ship.

837. Is that the first ship you know of that has adopted your plan?—The first I know of.

838. What is the name of that ship?—The "Maori." I may say that this ship sprang a leak after being about a fortnight out, and they had to come back again and discharge her coals, and reload fresh coals.

839. (*Mr. Icely.*) What form of iron pyrites distributed through coal do you consider to have the most dangerous tendency?—I do not care whether it is iron pyrites or sulphur; if there is any difference, in my opinion they both tend to the same thing.

840. There are some varieties of coal which you consider especially dangerous?—Yes, there are some coals very dangerous.

841. And you reject those in your selection of coals for the navy?—Yes.

842. Could you name any of them?—I should not like to name them.

843. After you have made a purchase of coal, is not there a coal viewer at the ports to inspect the coal?—Yes, a coal inspector at each of the ports.

844. What are the instructions which the Government give him in inspecting coals?—He is particularly ordered, first, to watch the proportion of small; secondly, to see that they are kept clear of slate and stones and other impurities, and thirdly, to see that all the brasses are picked out if possible.

845. If, for instance, he observes that the coal is dirty and small, has he the power to reject it?—Yes.

846. Or to prevent the shipment of that cargo?—At once. In all our tenders we make that a *sine quâ non*.

847. Do you attribute to this careful inspection the comparative safety with which cargoes of coal for Admiralty use have been carried?—I have no doubt a great deal of it is owing to that.

848. (*Mr. Young.*) What kind of coal was it that was shipped in the "Numea" in May 1874, that took fire?—Cowpen Hartley.

849. You said you investigated the circumstances both of that case and of the "Palmyra." What do you mean by investigation?—I made inquiries of the captain and the crew by their report.

850. After they came home?—Yes.

851. You read the protests and saw the captain and the crew afterwards?—I read all the protests and had to make out a regular statement for the underwriters.

852. And you saw the captain and crew after they came home?—I saw the captain and crew's reports. Perhaps I may here refer to a question which the underwriters raised. They got into their heads that the cause of the fires being now so numerous was that the coals were shipped direct from the pit into the ships, whereas formerly they used to be laid in heaps. Some of Lloyd's people asked me whether I did not attribute it to that cause, and I said it was a perfect fallacy. I said I would look upon dry coals shipped direct from the pit as being infinitely more safe than coals that have been lying in a heap; and moreover they would become completely valueless by being exposed a long time to the wind and the rain and the air, because their virtue would be gone to a great extent.

853. Have you known cases of spontaneous combustion of coals stored on shore?—Many cases.

854. More frequently than on board ship?—More frequently than on board ship.

855. You said that want of air causes spontaneous combustion?—Want of proper ventilation, not want of air exactly.

856. Spontaneous combustion could not take place without air?—There is always sufficient air in a ship; you cannot hermetically seal a ship.

857. (*Mr. Abel.*) You have given us only three cases of spontaneous combustion on board ship; those are the only cases that have come to your knowledge in all your experience?—Those are the only cases that have come directly under my own cognizance.

858. May we take it that these are really the only three cases that have occurred in all the shipments of coal with which you have been concerned?—You may.

859. Would you necessarily hear of every case of spontaneous heating of coal on board any ship carrying coal under contracts?—Certainly.

860. How would it come to your knowledge?—It would come to my knowledge by a complaint being made. If coals get heated they become discoloured, and though they may not be very hot, yet they are so discoloured that when they are inspected at the dockyard, or wherever they are landed, they are reported on; and those reports have always come before me for my opinion, that is as far as the Admiralty is concerned.

861. Therefore any case in which any real damage was done would come to your knowledge?—Yes, and the same as regards shipments for the Madras railway.

862. Supposing a case of heating occurred, but no damage was reported as having been caused to the cargo, you would not hear of it?—No, we have such a system that they are not apt to report cases of heating of coal of trivial importance, because coal cannot become heated without destroying a portion of it.

863. Those three are the three important cases of heating on board ship that have come to your knowledge?—Yes.

864. Personally, you have no positive knowledge of the cargoes of coal that those ships took out?—We have an inspector at each part who inspects the coal. I do not go to inspect each cargo. I know what kind of coals we purchase.

865. As regards one of the three cases which you

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mentioned, I understood you to say that, speaking from your own knowledge, the coal was practically free from pyrites?—I have just told Mr. Vivian that I believe in all coal there is pyrites sufficient to cause spontaneous combustion under certain circumstances.

866. I think in the earlier part of your evidence you stated, with reference to one particular cargo, that to your knowledge or belief there was no pyrites in that particular class of coal with which the ship was laden?—I, think I said that the particular coal I referred to was as free from pyrites as any coal.

867. Your view with regard to spontaneous combustion of coal on board ship is that it is entirely due to coal getting wet?—Entirely.

868. You attribute it to no other cause?—There might be another cause—red hot ashes put on it might cause it to ignite.

869. You think every coal is liable to spontaneous combustion?—Every coal except anthracite.

870. And you consider the only point to be guarded against is to keep water from the coal?—I do.

871. You spoke of the explanation the captain gave with regard to one of those cases of spontaneous combustion with which you did not agree; what was the captain's explanation?—I did not mean that the captain attributed the casualty to anything but water getting in. He said he was perfectly sure no moisture had got in amongst the coals unless, as he said, it had got in through the crevices of the deck or somewhere else in such a proportion that it could not do any harm. He wanted to show that the quantity of water had been so small that it could not do any harm. If what he had stated was true it could not have done any harm. No doubt a very small quantity on the top of the coals would not do much harm, but there was more than that; and in fact he admitted afterwards, in his report, that in a storm no doubt water got down somewhere or other, through the scuttles, or somewhere.

872. Do you think it is possible to prevent coal containing water when placed on board ship, even if placed there directly it leaves the pit's mouth?—I believe chemically all coal contains a certain quantity of water, but I do not believe there is sufficient water in coal internally to make it at all liable to spontaneous combustion.

873. You said that the larger the waggon the worse for the coal; will you explain what you meant by that?—Simply because one waggon will contain 2 tons 13 cwt. and the other will contain 10 tons. If a heavy shower of rain were to come on to those coals contained in the 10-ton waggon there would be a larger surface of coal exposed than in the other case, and if the coal were to be exposed long to the air it would destroy the coal. If you expose coal to wind and rain you destroy its power in a great measure. That was what I meant, that the waggon being larger, more surface was exposed.

874. (*Mr. Ferguson.*) Seeing that you attribute spontaneous combustion to water mixing with the coal, is the system of ventilation which you propose solely to counteract the dampness of the coals?—It would carry off the heated atmosphere from whatever cause.

875. I understood you to say that spontaneous combustion was only caused by the coals being damp?—That is my opinion.

876. Therefore your system of ventilation would be to counteract that?—Certainly.

877. In the many thousands of tons of coals that you have shipped, have all the vessels which have carried those coals without damage been ventilated in that way?—Not that I know of.

878. Have they been ventilated at all?—Not that I know of.

879. With regard to the vessels in which you say the heating was caused by water getting in, did that water come from above or below?—It came from above, I believe, in both cases.

880. From the quantity of coal you ship for abroad you must be aware, I suppose, of the extent to which the coal depreciates after being carried a few months in the ship's hold; if 10 tons of coal will do a certain amount of work here, will it do the same amount of work when it arrives at its destination?—You must take a little per-centage off for the breakage, but apart from that it really suffers very little harm, it does the same work and evaporates the same amount of water. If you stack it in the sun and rain for a month you will take away 10 per cent. of its value at once.

881. Do not you find that the gas accumulates in the ship's hold during the passage, and does not the coal thereby lose some of its combustive power?—No; I think the best steam coal retains its gas in its integrity.

882. Is it not the fact that coals lose their combustive property to a great extent in the course of the voyage?—Very little. There is no way of escape for it.

883. (*Mr. Duncan.*) You have described a method of ventilation which you think would make ships perfectly safe from spontaneous combustion?—I think so.

884. In describing that mode of ventilation I understood you to say that you would have a horizontal shaft in the centre of the ship?—Yes.

885. About what size?—According to the size of the ship.

886. What would be the size of the shaft for a ship 1,000 tons register?—I should say a couple of feet square.

887. You would have that go right along the centre of the ship?—Right along the centre of the ship.

888. Not quite in the centre, because you would have to keep clear of the iron stanchions that go up and down?—You could not lay it along the keelson, but I should prefer it being about 3 feet from the bottom, just laid along the whole length of the ship; then I would have a connexion at each end with the deck, so that the air might come down. There would be a funnel forward going up above the deck as they have for ventilating the cabins and holds of ships, so that it would catch the air and draw it into this shaft; by that means there would be a continual current of air. I would have upright shafts at certain distances made with louvres, so that the air would pass along each one of those continuously. Then if there were any heat it would pass up through those louvres into the open air.

889. You would carry these louvres 4 or 5 feet above the deck, so that in all weather they would be open?—Yes; but loaded so that water could not get admission.

890. Would it alter your judgment in reference to the safety of your plan if you were told that it had been stated to this Commission that spontaneous combustion had taken place in ships ventilated in that way?—It would not at all, because I know that ships that have taken fire have not been ventilated.

The witness withdrew.

Mr. Samuel E. Derry examined.

891. (*Chairman.*) You were, I think, from 1859 to 1868, inspector of coal shipped for the Admiralty in South Wales?—Yes.

892. What was your district?—All the ports of South Wales.

893. You are now an engineer in the service?—I am a retired chief engineer in the Navy.

894. During that period, from 1859 to 1868, you had some experience of cases of spontaneous combustion?—Three cases; they were all one description of coal.

895. What was the coal?—Parsons Abbey Graigola.

896. All the three cases of spontaneous combustion

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Mr. S. E. Derry.

15 June 1875.

which came within your knowledge were of that one description of coal?—Yes.

897. Will you give to the Commission some particulars of those cases?—In 1864 a complaint came officially before me with regard to coal having caught fire at Jamaica and Barbadoes, and also in a vessel arriving while they were extinguishing the fire at Barbadoes with the same coal on fire on board of her.

898. Were those cases all in the same year?—Yes, in 1864.

899. How long had the ships which carried that coal been out?—I should think about six weeks.

900. Those were the only cases which came under your knowledge in your 10 years' experience?—Those were the only cases of spontaneous ignition that came under my official knowledge during the whole of that time; but I think the same coal caught fire in Keyham Yard at the same time.

901. That was not within your official knowledge?—No.

902. What is the character of that coal?—It is a smokeless coal from Llansamlet, not produced in the regular steam coal district.

903. Was it shipped under any particular circumstances?—Not at all.

904. Was it shipped in fine weather?—I do not think the weather would have anything to do with it. I think the same coal would catch fire under the same conditions if sent out again.

905. What is the chemical character of the coal; does it contain a large proportion of iron pyrites?—It is not that the iron pyrites is in a large proportion, but it is so intimately mixed with the coal as to be in a most favourable condition for catching fire. If you took a piece of coal from that vein you could see that the coal and the iron pyrites were intimately mixed, perhaps there would be an eighth of an inch of iron pyrites and an eighth of an inch of coal, and so on, as if laid alternately on purpose to facilitate its catching fire. In other steam coals there is plenty of iron pyrites, but if it is localised in large masses it is not so likely to take fire as where distributed in the manner I have mentioned.

906. Was this coal shipped smaller than the average of South Wales steam coal?—It naturally works smaller than the average of South Wales steam coal.

907. Otherwise there was nothing peculiar either as regards the length of time that it was exposed or as regards moisture, which it was subjected to?—Not that I can remember.

908. Nor was there any report made showing that during the voyage anything occurred which might have pointed to the cause of the coal catching fire?—No; the fact of the coal catching fire in so many different directions at the same time would appear to indicate that it was in the nature of the coal itself and not in any particular circumstances connected with it.

909. Did you in the course of your official duty lay down any particular regulations in connexion with the shipment of coal?—I did. I put the conditions for the shipment of coal for the Admiralty in South Wales into order. The conditions I laid down were that the coal should be free from small at the time of shipment, but of course one necessary condition is that the coal must be clean, that is to say, free from large quantities of iron pyrites. You cannot get coal perfectly free from sulphur, but it must be free from large quantities, and it is required to be free from small coal. Those were the stipulations that I had to see fulfilled.

910. Was there any stipulation in the contract as to the ventilation of the ship?—None; it did not become necessary for the Admiralty to look into such regulations as that, for if the coals were not supplied at the port, the Admiralty did not pay for them.

911. They were paid for on delivery?—Yes.

912. Still the Admiralty were interested in the coal that they required for a particular station not disappearing on the way?—So far as keeping up the supply went they were interested.

913. When those casualties took place was the matter referred to you?—It was.

914. In each case you satisfied yourself that it was the fault of the coal?—Yes.

915. And not the fault of the ships?—Not in any way.

916. (*Mr. Vivian.*) How much of this Parson's Abbey Graigola coal did you ship?—2,000 tons I should think, at least that?

917. It fired in three cases?—Yes, at the stores in the dockyard at Jamaica; at the stores in the commissariat department at Barbadoes, and also in a vessel arriving at Barbadoes while the coal was on fire on shore with the coals on board on fire.

918. What quantity out of that 2,000 tons would that represent?—Perhaps nearly half the quantity.

919. There are considerable quantities of that coal shipped are there not?—They have one particular vein, the coals from which are liable to take fire spontaneously.

920. What is that?—The Tyr Edmond. When they do not ship the Tyr Edmond the coal is free from danger, when they do I think it is certain to ignite.

921. Had the coal been long on the bank before being shipped?—No, it never is.

922. Was it wet or dry?—I cannot remember whether it was rainy weather or not.

923. That is the only South Wales coal which in all your experience you have found liable to spontaneous combustion?—Yes; it depends on the condition of the coal. In the case of all coal where the coal is small the particles of sulphur get more intimately blended with the coal, and in this particular coal ignites spontaneously; but I never heard of good marketable South Wales steam coal catching fire spontaneously in the main body of the coal?

924. How much coal did you ship altogether during the 10 years you were in South Wales?—It must have been millions of tons. I shipped 27,000 tons in one month.

925. Out of the millions of tons you shipped only those three cases of spontaneous combustion occurred?—That is all.

926. Did you ship any patent fuel?—Yes.

927. Have you known a case of spontaneous combustion in patent fuel?—Never.

928. (*Mr. Icely.*) Have you ever inspected jettisoned cargoes in cases where spontaneous combustion has occurred in other vessels not connected with the Admiralty?—Never. I never knew South Wales coal catch fire except in those three instances to which I have referred.

929. Did you never know of any other case of heating in South Wales coal?—No. I have known of explosions of gas in vessels, not spontaneous ignition.

930. (*Mr. Young.*) Are those explosions noted? Do they come under your notice?—No; those explosions have not been in the case of any cargo that I have had officially to do with, but when they improperly put on the hatches before the cargo has had time to give off its gas, an explosion takes place now and then; the gas ignites.

931. When a light is put to it?—Yes. It is not uncommon for a vessel to come back to Cardiff after it has got out into the Bristol Channel.

932. On account of damage having been done by explosion?—Yes, the coal gives off gas.

933. Does that refer to all kinds of South Wales coal?—I should think so. You may see the coals giving off the gas in the pits.

934. You think it is a very important thing to keep the hatches off in all vessels?—It is a standing order in the docks, but which is disobeyed very frequently.

935. Do you think ventilation would do away with that danger of explosion?—I think ventilation is absolutely necessary.

936. You have mentioned three cases in which this coal took fire. Did you ship any more of that same coal after that?—No.

937. You ceased shipping that coal at once?—Yes.

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938. Have you had any remonstrances from the colliery owners for tabooing them in this way?—The colliery owners were only too glad to be quiet under the circumstances.

939. (*Dr. Percy.*) Could you give us a specimen of this coal?—No, I cannot furnish the Commissioners with a specimen.

940. (*Chairman.*) Is the seam still worked?—I do not know.

941. (*Dr. Percy.*) I think you said that the danger of spontaneous combustion was lessened by the small coal being separated from the large coal?—Yes.

942. If so, can you assign any reason for that?—I have tried to assign a reason for the fact that the presence of small coal is liable to assist spontaneous ignition, and I think it is because in the small particles of the coal the sulphur and the coal become more intimately mixed together, and then the coal is in a more favourable condition for catching fire than when the pyrites is in large masses.

943. Do you know whether any investigation has been made by the direction of the Admiralty with regard to the proportion of iron pyrites in small coal as compared with large coal?—I am not aware of any.

944. You spoke of the mode in which the iron pyrites was intermixed with this coal. You spoke of the mixture as being intimate?—Yes, there would be a thin layer of coal and a thin layer of pyrites.

945. Would you call that an intimate mixture?—Yes.

946. Is not there plenty of coal in which the iron pyrites is diffused so minutely that you cannot see it?—Yes, and it is not dangerous then, I should think.

947. What was the thickness of the layer of iron pyrites which you saw?—The layers varied. Perhaps on an average they would be about an eighth of an inch.

948. Was the layer pretty continuous throughout?—It was not straight.

949. Was it all through the coal; did all the lumps contain it more or less?—Yes. I think it was pretty well distributed throughout the whole of the coal of that vein. There were coals of two veins in the cargo; but in the case of that vein I think the iron pyrites was pretty well distributed throughout.

950. What examination was made by the Admiralty of that coal before it was ordered?—Only the examination I made of it at the time of shipment.

951. Simply an inspection?—Yes.

952. Was any test taken of its heating power?—Yes.

953. Was there any other examination made of it?—No. In fact any trials of the coals would be to a certain extent fallacious; for supposing the cargo to consist of coals from two veins, it is easy to send the best for trial, and to send the coal from the other vein for shipment.

954. Is any examination made on the part of the Admiralty with the view of ascertaining whether coal which is being shipped for the use of the navy contains iron pyrites?—In all cases before coal was admitted for Admiralty use it was sent to the dockyard for trial.

955. In the particular case of which you have been speaking, was the proportion of pyrites contained in the coal directly ascertained or not?—Not at all. I think it exceedingly probable that no coal containing pyrites was sent for trial at all.

956. Is any examination made of coal at the Admiralty with respect to the proportion of pyrites contained therein?—Now I have nothing to do with it; I have ceased to have anything to do with it for five years.

957. In your time was it the practice to have an examination made with a view of ascertaining the proportion of iron pyrites contained in coal?—I merely went on my own judgment by inspection.

958. (*Mr. Duncan.*) In your judgment the circumstance of the coals getting wet in the wagons between the time of their leaving the pit's mouth and of their being put on board ship was not a matter of serious importance?—I think it would assist to set up spontaneous ignition if the coal was shipped wet.

959. Are you able to explain at all what the action of wet upon coal is?—I am not a chemist. I only know that it is desirable to avoid shipping coals containing an excessive amount of sulphur.

960. Have you any reason for thinking that the application of water to coal is likely to induce spontaneous combustion?—No; I only know that it is the generally received opinion that moisture superinduces heat.

961. You have no practical experience in that direction?—I have not.

962. (*Chairman.*) Is it your impression that coal containing iron pyrites distributed in the manner you have described will burn spontaneously without moisture, or is it your impression that moisture is a necessary element?—Supposing the iron pyrites to be so mixed in the coal as to cause the coal to be in a state favourable for spontaneous combustion, then I think that either damp or friction will cause spontaneous ignition. I think friction might cause it in the working of the vessel at sea in the same way as striking a lucifer match.

963. (*Mr. Duncan.*) From your observation of the lumps of coal when they have been coming down for shipment, is it your opinion or not that the pyrites is lying on the surface of the pieces rather than in the centre of them?—No; I do not think that the iron pyrites is present in one part of the coal more than in the other. I think coal brought from any particular part of a seam is equally liable to contain iron pyrites as coal brought from any other part of the seam. I have noticed pieces of coal which bore signs of having been wrought from the bottom or the top of the seams, but I do not think that they gave any particular indications of sulphur.

964. You do not think that the dust coming off the top and the bottom of the seam would contain a larger proportion of iron pyrites?—I do not suppose my opinion upon the point is of much value; but I think the pyrites is distributed through the whole of a seam, here, there, and everywhere. I think there is no rule for it.

965. You do not think that there is more pyrites among the small than among the large coal?—No, not ton for ton.

966. (*Mr. Vivian.*) I think you said that the small of the steam coal in your judgment was liable to spontaneous combustion?—More so than the large.

967. You have been at Aberdare?—Yes.

968. Formerly large heaps of small coal used to lie at the pit's mouth, where it was subjected to the very best conditions for catching fire, the small coal being exposed to the weather for many years?—Yes, for 10 or 12 years.

969. So that if the small coal were liable to spontaneous combustion it surely would have taken fire in that case?—It is not generally liable to fire; still, I have seen it on fire, and at the docks too.

970. Do you mean small coal?—Yes.

971. Are there any large heaps of small coal at the docks?—There used to be large accumulations in my time. When they began to screen coals they had a large quantity of small after screening, and it lay there perhaps some months.

972. You have seen that in some cases on fire?—Yes, and in the collieries in the Aberdare valley I have seen small heaps on fire.

The witness withdrew.

Mr. Orestes Brooker and Mr. James Harwood examined.

973. (*Chairman to Mr. Brooker.*) You are now employed at Portsmouth?—I am.

974. (*To Mr. Harwood.*) So are you, I believe?—Yes.

975. (*To Mr. Brooker.*) You were formerly inspector of coal for the Admiralty in the Northumberland and Durham district, were you not?—Yes.

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976. How many years were you inspector there?—Nearly four years.

977. Do you remember how much coal passed under your eye during the time you shipped for the Admiralty?—I suppose about 50,000 tons.

978. During that time, were there any cases of spontaneous combustion of the coal so shipped?—Not at the port.

979. But after the ship left port?—Yes, I heard two years afterwards that spontaneous combustion had taken place in one case; I fancy it was at Jamaica.

980. In one single case?—Yes.

981. You only know of one case of spontaneous combustion in all the coal shipped from the north during those four years from 1864 to 1868?—One case only of government coal.

982. Were the particulars of that case referred to you for report?—Yes, and on examining my book I found I had inspected but very little of the cargo in consequence of my having other ships to inspect.

983. Do you remember what coal it was?—No, but I think it was shipped in 1865.

984. You ceased to hold that office in 1868?—Yes, early in 1868.

985. Does your recollection go to any other circumstance connected with that case of spontaneous combustion?—No, only that the report from that station was that the bulk of the cargo was small and contained pyrites.

986. All that you remember about it is that it was at Jamaica?—I think it was at Jamaica. I know it was at some hot station.

987. Beyond that, what the coal was, or how it was shipped, or as to any of the circumstances of the casualty, you have no recollection?—No, I was not present when it was shipped.

988. Were your instructions to avoid any particular classes of coal as liable to spontaneous combustion?—I had no instructions to that effect; my instructions were to receive what was considered first class coal.

989. The question of the liability of coal to spontaneous combustion was not one which came prominently under your notice?—No.

990. Was not it included in the Admiralty instructions at all?—No, at least I never received any instructions upon spontaneous combustion.

991. So far as the shipment of coal under your responsibility is concerned you cannot give the Commission much information as regards spontaneous combustion?—I objected, and complained if brassy coal were permitted to pass into the waggons or ships. I had a suspicion that if I were not present that this coal would be passed; that they would not be so particular about it.

992. You were specially there to prevent coal with sulphur in it from being shipped?—My instructions were that the coal were to be fresh raised and properly screened from dust. I occasionally went to the pits to see if they were so; the people at the colliery not being aware of my intended visit. When I found that in the case of this particular cargo there had been spontaneous combustion, I was inclined to think that it was in consequence of my not being there to inspect

993. That is to say that they had taken advantage of your being overworked to ship a considerable quantity of brassy coal?—That was a thing I could not prove.

994. Was that the only cargo you had not the opportunity of inspecting?—Yes; there would be several cargoes that I could only inspect one-third or perhaps two-thirds of, but I do not know there was any other entire cargo, that I did not inspect.

995. Were you supposed to see every ton of coal that went into the ship's hold?—If I possibly could.

996. We understand that you and Mr. Harwood can give us some information as to the storage of coal at Portsmouth. How is coal stored there?—The coals are stacked into heaps about the dockyard and exposed to all weathers; in other places they are under cover.

997. Is there any coal afloat also?—Yes, there is coal afloat in the hulks.

998. What sort of quantity is usually exposed to the weather on shore?—Probably 7 or 8 thousand tons; at the present time there is not so much, but a year ago there was a very large quantity in the dockyard.

999. How much coal do the coal hulks hold when full?—I think they hold about 2,000 tons each.

1000. Have you had any cases of coal heating in the dockyard or in the hulks?—No, I never heard of any.

1001. Though a large quantity of coal is constantly exposed to the weather?—Yes.

1002. Is there much small in the coal?—There is a very large quantity sometimes.

1003. And you have never had a case of heating?—I have never heard of any case of heating.

1004. (*To Mr. Harwood.*) Have you ever had any cases?—I have had one case of heating.

1005. Will you tell us the circumstances of that case?—When I was at Jamaica at the Port Royal Dockyard, we had a case of heating. There is a large coal store there.

1006. How did that arise?—I think it occurred from the coals getting wet on being taken ashore, and from their lying in the store; they were lying in the store for two months I should think; the name of the coal was, I think, Parsons Abbey Graigola.

1007. In what year was that?—In 1864.

1008. Did that coal visibly contain a large amount of pyrites?—I did not observe more than usual.

1009. You could not detect the presence of an undue quantity of pyrites?—No.

1010. That is the only case that has come within your knowledge of spontaneous combustion of coal?—Yes, that is the only case I know of.

1011. What did you do in that case?—I had the coals taken out of the store, and when it was replaced, I put iron tubes into it of various lengths suspended from the beams in the roof. I found that these tubes carried off all the gas. I always adopted that plan afterwards, and there was no more heating.

1012. You never heard of any case of dangerous heating in that store since?—No. It was a very large store.

1013. (*Mr. Cory to Mr. Brooker.*) When you were inspecting in the north, and were not able, as you say, to see the shipment of every cargo, were you absent at long intervals from a particular place, could your absence be calculated on?—I do not know that they could calculate on my absence: perhaps I would go to Sunderland, then to Tyne docks, and then to another place probably.

1014. As to this brassy coal which you suppose to have been shipped behind your back whenever you were absent, where did it come from?—I do not know, I cannot recollect it being got 10 years ago.

1015. If this brassy coal could be shipped during the interval of your absence, surely it must have been lying in the neighbourhood already?—No; because it comes five or six miles by train; to the mouth of the pit it would be five or six miles.

1016. Were they steam coals?—They were steam coals.

1017. Newcastle coals?—Newcastle coals.

1018. Were they Hartley coals?—Some description of Hartley coals.

1019. Would not they have to come 20 or more miles to the shipping place?—Not so much as that, I think.

1020. Did the coal come down the Blyth and Tyne railway?—I am not certain about that.

1021. You do not know that the coals come from the north of Blyth, 20 miles off?—No, I do not.

1022. You really think that these coal owners, or their agents, were laying by this brassy coal to put on board when your back was turned?—No, I do not say that, but it seemed to me strange that that should be the only cargo taking fire I could not inspect.

1023. You only know of one cargo being on fire?—That is all.

1024. And it happened that in that case you did

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not very closely inspect the coals?—I was not able to inspect them.

1025. Do you draw from that the conclusion that whenever your back was turned brassy coals would be put on board?—No, I have not said that, but I conclude that they would not be so careful.

1026. (*Mr. Fenwick.*) You say that there are occasionally 2,000 tons stored in the hulks; is there any means taken to ventilate those hulks?—I do not know of any

1027. (*Mr. Icely.*) Are you in favour of ventilating coal cargoes?—Yes.

1028. For what reason?—I think that by ventilating the coal you get rid of the gases; which may be done by putting tubes into the centre part of the cargo. I know this, in my own case, that in the "Crocodile" Indian troop ship the temperature of the coals near the boilers would rise to 136°, and by opening our outside ports the temperature would be lowered.

1029. Are you speaking now of the coals that were in the bunkers at the back of the boilers?—Yes, at other parts of the bunkers the temperature would be about 80° or 90°. I am speaking of when we were in the Red Sea.

1030. What year are you speaking of?—1871.

1031. You were in the Crocodile for some time?—Yes, for 4½ years.

1032. For what period?—From 1868 to 1872.

1033. During that time had you any cases of heating of coal?—None whatever.

1034. This heating up to 136° you attributed to the heat of the boilers?—Yes.

1035. Do you suppose that eventually spontaneous ignition might have resulted from that heat unless you had taken steps to promote ventilation?—Yes, and I began to work upon that coal immediately. I made use of it at once.

1036. Will you describe the custom on board ship with regard to ascertaining symptoms of approaching danger?—All coal boxes are fitted with temperature tubes, and every four hours the thermometer is put down in the tube, and is allowed to remain for 20 minutes and then taken up to see what the temperature is. Where there is danger it is done every half hour. The temperature tube plugged at the bottom and partly filled with water gave, it seemed to me, a quicker indication of the heat.

1037. Did you notice in this particular case when the temperature rose to 136° that the temperature rose rapidly?—No, it rose gradually; it rose as the weather got warmer.

1038. What would be the ordinary temperature when you commenced to take it?—About 90°.

1039. What period elapsed between the time when you found it was 90° and the time when it rose to 136°?—Two or three days.

1040. And it was still increasing?—No, it remained stationary there for three or four days till we got out of the Red Sea.

1041. You do not apprehend that it would have risen any higher?—No; at first I was rather uneasy, but on the second trip when it came to that temperature and did not go beyond, I did not apprehend any danger.

1042. Are you of opinion that the opening of those ports was sufficient as a means of ventilation?—Yes, that was my opinion, the air entering from the bunker doors when raised caused a circulation.

1043. Do not you think a circulation of air would be better; do not you think an inlet as well as an outlet would be more advantageous?—Yes I do; an outlet either into the steam funnel or the galley funnel would cause a draught.

1044. That would induce an active current?—Yes.

1045. In the "Crocodile" your coal boxes were in compartments, were they not?—Yes, seven compartments.

1046. And you had watertight doors?—Yes, two to some compartments and one to others.

1047. In fact you hermetically sealed your coal boxes when the bunker lids were on?—Just so, and the bunker lids were made like a joint to keep out the water lying on the decks.

1048. Do not you think there is greater chance of fire or spontaneous combustion where the bunkers are hermetically sealed, as it were, than there would be in the ordinary case of an old ship where the bunkers are not isolated in that way?—I certainly do. I never knew of any case of gas explosion in the many wooden ships I have served in.

1049. Do you think it advisable that in the bunkers of those iron-clad ships there should be a means of ventilation?—Yes, I do, by means of tubes placed in a zigzag direction, so that the coal may be more fully penetrated with ventilation.

1050. (*Mr. Duncan.*) Have you any impression in reference to the effect of shipping coals wet?—I have no practical experience as to that, but I should imagine that coal with a large amount of small in it, when shipped wet, and especially when not well hand-picked at the pits, would cause spontaneous combustion.

1051. For what reason?—I cannot give you any other reason than that which is usually assigned.

1052. You cannot say from any chemical or scientific investigation that the application of water to pyrites would be likely to cause combustion?—No.

1053. In the 150,000 tons of coal you saw shipped, many of the cargoes went on board wet, I suppose?—Some of them were so.

1054. You did not object to their being shipped in rainy weather?—No; other ships were waiting to be loaded, and if I had detained a cargo, there would probably have been some "demurrage."

1055. You objected to them if you saw indications of sulphur on their surface?—Yes.

1056. That would have the effect of causing the people at the colliery who were sending down coal for the use of the Admiralty to be careful not to send down waggons of coal that had such indications in them?—Yes.

1057. Have you sent back coal which possessed such indications?—No; but I have always cautioned the colliery agents that I should do so. I may say that the coals I saw were very fair indeed. The difficulty I had to contend with was the small coal. I visited the pits to see what screens they were using.

1058. It is hardly a fair inference, is it, that because you happened to be away, in the case to which you have referred, they sent in sulphurous coals?—The impression I had then was that this coal would not have been passed by me.

1059. Have you seen them shipping sulphurous coals to any other vessels when you have been inspecting coals shipped for Admiralty use?—I have certainly seen some things going on, but it was no business of mine, that is to say, those things did not occur in connexion with the coals I was inspecting.

1060. Have you seen coals being shipped on board other vessels for private use that you would not have taken for the Admiralty?—Certainly I have.

1061. In consequence of their containing apparently a large quantity of pyrites?—Yes, and I have seen water thrown upon the coal, and when I have asked them what they did that for they would say to lay the dust. I thought it was to increase the weight.

1062. While you were inspecting coals for the Admiralty you must have seen many other shipments of coal for private use; in your judgment, were there more sulphurous coals among those than among those shipped for the Admiralty?—Coal under no inspection is not so well shipped, nor of such good quality, nor such large coal as that which is shipped under inspection. I have seen coals shipped in such a careless way that if they had been large they would soon have been reduced very much in size.

1063. When coals are wrought from the bowels of the earth, have they frequently evident indications on their surface that there is a large quantity of pyrites or sulphur in them?—I have not seen much of it in

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the coal I have inspected; I know there are pyrites in all coal.

1064. Are you aware that the miners when they come upon it know it perfectly?—Yes.

1065. And that they would put it on one side if they were desirous of keeping it out of the coals they were shipping?—I know that coal containing pyrites will come down for shipment in spite of all precautions. When I have been at the pits I have seen two boys probably at each screen hand-picking the coals, and still I know there was a difficulty even then in keeping out the sulphurous coals, because while I have been watching the boys picking out the coals I have said "Here is one piece you have let slip by." I know they were very particular while I was there.

1066. You know there are coals with large quantities of iron pyrites in them which are picked out by the coal shipper?—Yes, the coal is supposed to be hand-picked.

1067. Do you think it probable that the more frequent occurrence of cases of spontaneous combustion during the time that coals were dear was due to the fact that they were not so particular to hand-pick those pyritic pieces?—Very likely it was partly due to that.

1068. (*Sir G. Elliot.*) You say you were stationed on the Tyne?—Yes, at the northern ports.

1069. You would be at the ship at the time the coals were shipped?—Yes, the greatest part of my time would be at the place of shipment.

1070. Had you any written instructions as to your inspection?—Yes.

1071. Have you a copy of them with you?—No.

1072. Do you remember what they were?—I was to see that the coals were not small, to be fresh wrought, and properly shipped. They were to pass over half-inch screens.

1073. Were you directed to take care that there should be nothing in the coals that would lead to spontaneous combustion?—I think not. I do not remember anything to that effect.

1074. The main thing you would pay attention to as inspector would be to see that the coals were large and as free from small as possible?—Yes, that would be one of the principal things.

1075. And that they were put into the ship with as little breakage as possible?—Yes, and this had to be equally well watched.

1076. That would be about the extent of your duty as inspector?—Yes.

1077. You attention had not been directed so much to the spontaneous combustion of coals on board ship at that time?—No.

1078. (*Chairman.*) When you said you rejected coal that looked as if it had much sulphur in it, did you do it on your own motion or under instructions?—When I found coal having those indications I made a complaint.

1079. (*Sir G. Elliot*). You mean this; you saw something go in which had certain appearances which caused you to reject it, but you did not reject it because you thought it would be likely to ignite spontaneously?—I knew that sulphurous coal would be liable to cause spontaneous combustion.

1080. You had no direction about it?—No.

1081. Therefore whether it had been a piece of stone or a piece of pyrites you would have objected to one as much as the other?—I would have objected to the stone as well as the pyrites, because my duty was was to see that coal shipped.

1082. You saw a great many stones go in as well as pyrites?—Not many. Not enough to cause any complaint to be made by me.

1083. One part of your instructions was to see that the coals were sent away free from small. Was not there also an instruction that they were to be clean?—Yes. You could not expect coal after travelling 10 or 15 miles to arrive at the ships without some dust in the coal.

1084. You said that coals that were shipped under inspection were larger and better than those which were shipped without inspection. Do you suppose the viewer at the colliery, who has the charge of the production of the coal, knows when he is drawing coals out of the pit and putting them into the truck, whether there is a ship at the drops for the Admiralty, or a ship for the Austrian Lloyds, or for any other large company who have no inspectors? Do you suppose they know the difference at the colliery?—I know I went into one pit, and found that the screens were not according to the Admiralty width; that is some of the screens were three-eighths instead of half an inch. I objected to the Government coal passing over those screens, and they did not allow them to pass over the three-eighths screens. The ship to which those coals were going was the "Constance," and the trucks were marked "Constance." They must have known that the coals were being shipped for the Government, because they always got intelligence from the agent at the docks that the coal was for the Government, and there was more care taken in consequence.

1085. You were not often at the colliery, were you?—Not often, but as often as I could be.

1086. What colliery was that to which you refer?—The Hastings Hartley.

1087. Do you know what quantity they raise in a day?—Yes, I believe I do.

1088. 1,000 or 1,500 tons a day?—Yes; and it is one of the best coals too.

1089. Do you think they know when each ship goes under the drops, and that they regulate their screens to suit it?—I saw that they were passing the coal over some three-eighths screen, and on my calling attention to it they passed the coal over the half-inch screens.

1090. You say you would not often go to the colliery to see how it was done?—No; I would go about once a month to the different collieries.

1091. How many collieries were you supplied from?—I suppose, roughly speaking, about a dozen.

1092. You would get to each colliery once in 12 months?—No; I would take one here and there, oftener seeing those I took the most coal from.

1093. Your inspection of what they did in loading could not have been very minute?—Not at the pits, as my visits were few; but as I said before, coals under inspection were better in every respect.

1094. When you were looking at them they took more care than when they were not being looked at?—Yes, that was the case.

1095. How many tons out of those 150,000 tons did you see shipped?—I dare say I saw 35,000 tons of them shipped.

1096. You had not much time to go to the collieries?—No.

The witness withdrew.

Mr. W. Covey and Mr. R. Moore.

Mr. WILLIAM COVEY and Mr. ROBERT MOORE examined.

1097. (*Chairman to Mr. Covey.*) You are chief inspector of machinery?—I am.

1098. (*To Mr. Moore.*) You are chief engineer?—Yes.

1099. (*To Mr. Covey.*) You have charge of the steam reserve?—Yes.

1100. You can give the Commission some information as to the storage of coal at Devonport, can you not? how is the coal stored?—Some of it is housed, and some is not.

1101. Is any afloat?—Not at Devonport only what is kept in small hulks.

1102. All your experience, therefore, of storage at Devonport is storage on shore?—Storage on shore.

1103. How much coal is usually in stock there?—I could not say, as I have no charge of coals in the dockyard; I do not know.

1104. (*To Mr. Moore.*) Can you say?—I have no idea at all.

1105. (*To Mr. Covey.*) Can you give us any infor-

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mation as to any heating of coal in store either at Portsmouth or elsewhere?—I have never seen any heating of coal.

1106. (*To Mr. Moore.*) Have you seen any heating of coal?—No.

1107. (*To Mr. Covey.*) Have you seen any heating of coal afloat?—No, not heating. I have never seen any heating in any case.

1108. (*To Mr. Moore.*) Have you any information to give us upon the subject?—I was in a ship on one occasion when we had spontaneous combustion in the coal bunkers.

1109. What ship was that?—The "Gladiator." That was 29 years ago.

1110. (*Mr. Fenwick to Mr. Covey.*) Is the mode of ventilation now different from what it was eight or nine years ago?—In some respects. Pipes are carried away from the bunkers into the funnel casing, and also ventilators are put on the top of the coal bunkers to ventilate them.

1111. Is it desirable that there should be ventilators in the bunkers?—I think so.

1112. Do you know whether fewer cases of heating have taken place since ventilators have been put in the bunkers?—That has come under my notice. Why I think ventilation is necessary is because I have never seen any heating, but I have seen an explosion of gas.

1113. (*Chairman.*) Can you give us any information about that case of explosion?—It occurred in the "Agincourt" about two years ago.

1114. Do you know what coal it was?—No; I cannot remember with certainty the name of the coal; it was a mixed coal.

1115. Had it been long in the bunkers?—No.

1116. Had the lids been kept on some time before the explosion?—No; they were taken off at the regular times.

1117. You do not remember any circumstance connected with the explosion which would be of interest to us?—No more than that. I think in all vessels where there are tank boxes, ventilation is required to allow the gas to escape.

1118. Was there no special ventilation in the "Agincourt?"—There were small valves on the top of the boxes.

1119. Has any order been given, or has any change been made since that explosion in the "Agincourt?"—An order has been given that coal boxes are to be ventilated.

1120. Does that apply to the whole service?—Yes.

1121. Was that the result of that explosion on the "Agincourt"?—Not at all.

1122. Was that one case out of many?—I saw that one and there was a case of explosion on the "Devastation" while I was there.

1123. Do you think that it was in consequence of those cases that that order was given?—Partly.

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1124. (*Sir G. Elliot.*) Do you know whether the ventilation of the ship is wholly self-acting or is it promoted by some mechanical appliance?—It is not promoted by any mechanical appliance, it is self-acting.

1125. Do you know whether such self-acting ventilation is sufficient in itself to keep the ship free from the accumulation of gas?—I think it would be sufficient. I have not actually seen the cases, but when the bunker lids have been on more than two or three days there has been an explosion whereas if they had been taken off every day such a thing would not have occurred.

1126. Do they go into the coal bunker with safety lamps?—They have safety lamps in working the coal boxes, they always use safety lamps.

1127. How is the explosion caused if they use safety lamps?—They would not have an explosion if they used them; but in this case, it being rather dark, the man took a light, though he ought not to have done so.

1128. So far as your experience goes, it is more limited to explosion rather than spontaneous combustion?—Yes, I have never seen any spontaneous combustion in any ships.

1129. What quantity of coal do you receive into the stores under your control, what is the largest quantity you have had at any given time in that depôt on shore, would you say 10,000 tons?—I should think there would be that quantity. I have no control or charge of coal in the dockyard; one building is three tiers high, others one; some coals have no covering.

1130. Are they all in contact?—There is a separation, a floor between.

1131. They are not more perhaps than 15 feet apart?—They are only divided by the flooring.

1132. The distance between the floors would not be more than 15 feet?—It would be quite that, it would be 20 feet.

1133. Would it make any difference, supposing instead of having those separate floors the coals were stored in one mass; would it have any effect in producing spontaneous combustion?—I should think so.

1134. However, by your appliances you never have had even heating; have you ever tried the temperature?—No, I have never had anything to do with applying tests in the store.

1135. Is there any opinion or theory amongst you gentlemen who talk about these accidents by spontaneous combustion, as to the cause of it; do you attribute it to any particular cause?—No, I have rarely heard of spontaneous combustion myself. I have heard of explosions. I have never known of any cases of explosion in wooden ships, where there is more likely to be an admission of air from their not being so perfectly tight.

The witness withdrew.

Adjourned to Tuesday next at 12 o'clock.

Tuesday, 22nd June 1875.

PRESENT:

THE RIGHT HON. HUGH C. E. CHILDERS, M.P. IN THE CHAIR.

Sir GEORGE ELLIOT, Bart., M.P.
HENRY HUSSEY VIVIAN, Esq., M.P.
FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD COBY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
JOHN PERCY, Esq., M.D., F.R.S.
WILLIAM YOUNG, Esq.

J. M. CARMICHAEL, Esq., Secretary.

Mr. W. R. PRICE examined.

Mr. W. R. Price.

22 June 1875.

1136. (*Chairman.*) You are a shipowner in London?—Yes.

1137. I believe you have had experience of more than one case of spontaneous combustion in ships belonging to your firm?—Yes, two cases.

1138. Both, if I am not mistaken, were cases of coal

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shipped from North Shields ?—Yes, in the Northumberland dock.

1139. They were both in the same month ?—Yes.

1140. The shipments in both cases were for the Peninsular and Oriental Company ?—Yes.

1141. Will you inform the Commission what the size of the cargoes was ?—Yes. The cargo of one of them, namely, the Calcutta, was 1,870 tons, to the best of my recollection, and the cargo of the other 1,600 tons ; the respective tonnage of the ships being 1,372 and 1,112 tons.

1142. They were both practically full ships ?—Yes.

1143. What were the names of the ships ?—The name of the 1,372 tons ship was the "Calcutta," the name of the 1,112 tons ship was the "Oliver Cromwell."

1144. Were they both wooden ships ?—Yes.

1145. Will you state what the character of the coal was ?—I did not see the bill of lading, but I believe it was Howard's West Hartley, I was told that was the coal.

1146. Were both cargoes shipped in the summer of 1874 ?—In June and July 1874.

1147. What was the ventilation adopted in the ships ?—I am relying on what I heard from my overlooker in the matter entirely ; the ventilation was a horizontal shaft near the bottom of the ship, from the keelson to the skin of the ship, boarded in, making a triangular current right through this communicating with two lines (about 18 inches square) of tunnelling along the tops of the 'tween deck beams, these being connected with upright shafts in each hatchway.

1148. Were the upright ventilators the one upwards and the other downwards ?—No, at least I imagine they would be self-acting.

1149. Do you know how the coal was put on board, was it by tips ?—From tips in both cases.

1150. Do you know from what height the coal fell ?—I could not state the number of feet. I was there when the Oliver Cromwell was under the tip, and it struck me as a very considerable height ; I do not know what the state of the tide was when I was there, whether the water is higher or lower at various states of the tide I do not know, but the fall was considerable.

1151. When you were there was the coal much broken in the fall ?—Very much indeed. I went into the hold of the "Oliver Cromwell" when she was about half loaded, and I noticed in the main hatchway where the bulk of the cargo was coming down a great accumulation of small coal in a pyrimidical shape, and I said to the captain as I came up, "I am thankful that "I am not the owner of this cargo, there seems to be "so much small in it."

1152. Can you give the Commission any information as to the nature of the casualty in the case of the "Oliver Cromwell," where and how it was observed, and what the result was ?—I took all the trouble I could to elicit the information, but the only parties who came home from the "Oliver Cromwell" were the captain and an apprentice ; the rest of the crew were paid off at the Cape and took other employments. Their information did not quite correspond, but at various times I had conversatlons with them, and the apprentice gave me to understand that there was no indication of anything wrong either in the fore or after peak of the ship where he was frequently down for various purposes. He never detected any escape of gas or anything of that sort, but he said that a fortnight before the fire broke out he noticed vapour coming up the main hatch ventilation, and he said as you passed between it and the wind, there was an unpleasant smoky smell, but they evidently treated it as nothing more than was usual in coal ships. I asked him whether they were not alarmed, he said not at all, and it was only the day before they had to abandon the ship, that the fire broke out and they noticed it by smoke oozing through the upper planking of the ship.

1153. Not coming up through the ventilators ?—Not coming up through the ventilators.

1154. How long had the ship been out ?—She sailed on the 18th of June and was burnt on the 6th of September.

1155. Did she become a total loss ?—She became a total loss.

1156. Was there any Board of Trade inquiry ?—There was an inquiry at the Cape.

1157. Do you remember what the result of the inquiry was ?—I remember that the general result was considered an unavoidable casualty.

1158. There was no scientific inquiry ?—No.

1159. That was the case of the "Oliver Cromwell" ?—Yes.

1160. Now will you give us the particulars of the other case ?—In the case of the "Calcutta" she sailed on the 2nd of July, and was burned on the 17th of September.

1161. In about the same place ?—A little wide of the same locality, but pretty much in the same region.

1162. Was she a total loss ?—She was a total loss, with a very heavy loss of life.

1163. What were the circumstances as reported to you about that ?—The few men that arrived at home were about as stupid a lot as I ever met with ; there was only one intelligent man among them.

1164. Was the captain lost ?—The captain was lost, he, a little boy of his, the chief officer, the carpenter, and several of the men ; 12 in all had the biggest boat, the others were in two other boats. It came on to blow the night after they left the vessel and the boats separated, and they never saw anything of the captain and his boat ; the others were picked up by a passing vessel.

1165. What information did they give you as regards the fire ?—They said they had no indication of the fire till it had gained considerable power, and a few hours afterwards they were obliged to abandon the ship.

1166. How did they notice it first ?—By smoke coming up the hatchway, and they immediately dug down into the coal and they got some distance below the line of 'tween deck beams, below the main hatchway, and then the heat was so intense and the smoke so suffocating that they were obliged to leave it. They poured down water and so on but without any effect ; it had gained a considerable hold of the cargo for almost immediately the masts fell over the side; they were iron masts. The water in the pump well with the intense heat at the bottom of the pump generated steam and blew all the pumping apparatus right out.

1167. Was she ventilated in the same way as the "Oliver Cromwell" ?—Exactly in the same way.

1168. Do you attribute the fire to any peculiarity of the coal ? Was any other coal of the same denomination shipped about the same time ?—In giving an opinion upon that it is simply my own individual opinion, I have no scientific knowledge upon the subject, but as far as I can reason upon the subject I attribute the loss to some inherent quality in the coals as in the other case.

1169. Was there any other ship loading with the same coal ?—The "Euxine" was loading in the dock at the same time ; she was an iron ship belonging to Messrs. Bates of Liverpool ; she was also burned.

1170. (*Sir George Elliot.*) Was the coal in each case from the same colliery ?—I think so. I could not positively say it was coal from the same colliery in the case of the "Euxine."

1171. (*Chairman.*) Were the coals loaded in the same dock ?—Yes.

1172. And probably in the same way ?—Exactly in the same way.

1173. And that vessel was lost about the same time as the others ?—A few days before the others ; she had not got quite so far. There was a curious fact connected with it that a ship called the "Corah," a large American ship, was loading about the same time. She was an American wooden vessel and the captain demurred to ventilation altogether. The Peninsula and Oriental Company coal inspector had some conversation with him upon the subject, as I gather from a report made by him to his directors, and the

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captain of the "Corah" said that he did not hold with ventilation except above the cargo, for instance, under the 'tween decks and under the main deck; that as to through ventilation he did not hold with it, but he said if the inspector insisted upon it he must do it; he said he had no instructions to insist upon his doing it, and so he left the captain to do as he liked.

1174. What was the result?—She arrived out at Bombay apparently without accident so far as I can see from the lists.

1175. I believe you have had great experience in shipping coal?—For the last 17 years I have scarcely carried anything else as outward cargoes to Bombay.

1176. Especially for the Peninsula and Oriental?—And for the Great Indian Peninsula Railway Company, and sometimes on our own account.

1177. So you can speak on the matter with very considerable experience?—Certainly; but not with regard to the Tyne, those were the only two cargoes I ever carried from the Tyne.

1178. Where have you carried principally from?—From Birkenhead in all cases, except patent fuel from Cardiff occasionally.

1179. Have you ever had any casualties in ships sailing from Birkenhead or Cardiff?—Never.

1180. Is the manner of putting the coal on board different in Birkenhead from what it is in the Tyne?—There are two modes of loading cargoes at Birkenhead; one is by tips similar to the mode of loading at the Tyne, and the other is by barrows. The railway runs alongside the dock and the railway wagons are brought alongside the ships, and when they are loading by barrows a stage is made right over the main hold; the coal is shovelled into barrows and wheeled over the hatchway; then the tackle is fastened to the barrow and it is lowered on to a platform in the hold, and it is then wheeled to the spot where it is wanted.

1181. In your opinion is that method preferable not only in reference to its doing less damage to the coal, but with reference to the subject of our inquiry?—Unquestionably that is my opinion.

1182. You think the distance that coal ought to fall should be a minimum?—I think there is less breakage, and consequently a better natural ventilation through the cargo; it does not lie in such a dense mass.

1183. You would recommend that all coal should be shipped in that way?—I put it this way; that in all cases I should stipulate for it where I could. I am bound to say that shipowners cannot command everything; but if I could, I would never ship a cargo otherwise than in that manner.

1184. With reference to ventilation, you have told us what the captain of the "Corah" thought about it. Have you formed any judgment upon the question?—I certainly have come to this conclusion, that if I were obliged to carry coal from the Tyne, I should certainly not adopt any other mode of ventilation than that which for 17 years I have successfully adopted in the case of vessels going from Birkenhead.

1185. With reference to your shipment from Birkenhead, what plan of ventilation have you adopted?—Exactly the same as I adopted in the Tyne; it has always been successful in the case of vessels going from Birkenhead; but it was fatal to me in the case of the vessels going from the Tyne.

1186. Your experience of the Tyne is limited to those two cases?—Yes; but there was the "Euxine" which was loading at the time.

1187. Was she lost also?—She was lost also.

1188. May that not have been from the coal in each case being supplied from one particular seam?—It may have been; I can call to mind several other vessels, one of them the "Bernice," that came from Dundee to the Tyne, she also was burnt close to Bombay, having on board Tyne coal. I could not say whether it was from the same seam. I have noticed more burnings in the case of vessels from the Tyne than I have from any other place.

1189. Are you aware that a good deal of the north country coal is shipped very much upon the plan you have described as being the one you prefer?—No, I am not aware of that; I never was on the Tyne except on the occasion when I had those two ships loading there.

1190. And when you were so unfortunate as to lose both ships?—Yes.

1191. (*Sir G. Elliot.*) The "Calcutta," you said, sailed on the 2nd July, and she took fire on the 17th of September?—Yes.

1192. How many days was that that she was out?—77 days.

1193. Now with regard to the "Oliver Cromwell," how long was she out?—I think she was out 80 days.

1194. Your two vessels, the "Oliver Cromwell" and the "Calcutta," both loaded Howard's West Hartley, did not they?—Yes; I have not seen the bills of lading. Directly I heard of the casualty to the "Oliver Cromwell," I went to the brokers office to ask what coal she had on board, and the message that came back was Howard's West Hartley.

1195. That was one of the vessels?—Yes, they were both chartered by the same parties.

1196. The "Calcutta" you say, was a total loss?—Yes, and the "Oliver Cromwell" was a total loss also. There were lives lost in the case of the "Calcutta."

1197. Then you said that the "Euxine" was loading at the same time, and that she also took fire?—Yes; she took fire a little earlier. I remember being in Liverpool and hearing an account of the loss, and it made me wonder how my ships stood, they having been loaded about the same time; it might have been in the early part of August that she took fire.

1198. Do you know what coal the "Euxine" took in?—I believe it was the same coal; I am speaking from impression; the parties would be very chary in giving me information about it.

1199. Then you mentioned the "Corah," and you said that she was loaded about the same time?—She was in the Northumberland Dock at the same time.

1200. The arrangements for the ventilation of the cargo in her case were dispensed with, and she arrived safely?—Yes.

1201. The other three vessels adopted the system of ventilation which you have practised for many years at Birkenhead?—I believe so; I am corroborated in that opinion by a report of the Peninsular and Oriental Inspector Mr. Steinson, in which he says, that he believes that they were so ventilated.

1202. (*Chairman.*) Will you read that report?—He says:—"November 1874. To the Managing Di-
"rectors of the Peninsular and Oriental Steam Navi-
"gation Company, London. Gentlemen, I beg to
"acknowledge receipt of your letter of 2nd inst.
"respecting the burning of the 'Calcutta,' loaded
"with Howard's West Hartley, at sea, and referring
"also to the burning of the 'Euxine' and 'Oliver
"'Cromwell,' with the same coal, and requesting me
"to institute careful inquiry into this matter, and as
"to the liability of this coal to spontaneous combus-
"tion. In reply, I beg to state that the 'Calcutta'
"and 'Oliver Cromwell' were both single decked
"wooden ships, and were well ventilated; the 'Euxine'
"was a double-decked iron ship, and I think also well
"ventilated. In looking over my journal I find these
"ships were all loaded in fine weather, that the coal
"looked very well, and the only remarks about these
"cargoes were that the ships were too high for the
"accommodation, and the coals consequently much
"broken in shipment. The 'Cora,' American ship,
"was loaded at the same time as the 'Calcutta,' and
"with the same coal; this ship was double decked, but
"the captain, who was a man of great experience,
"objected to through ventilation, but said, if I insisted
"on the ship being ventilated, he would do so, though
"he would rather not. I said I had no instructions
"as to ventilation, and my opinion was that it was
"unnecessary, and was dangerous in many cases, this
"ship was therefore not ventilated through the coal,
"but was well ventilated above it, and I find in my
"journal that a portion of this cargo got wet with
"hail and rain, and was thus more liable to heat. As

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" to the necessity of ventilation in cargoes of north " country steam coals, and the mode of ventilating, I " may state I have been giving this subject much " consideration for years, and more especially of late, " when so many ships are reported as having been " burned at sea by the spontaneous combustion of " their cargoes, and to the fact that, so far as I know, " all the ships which have been burned have been well " ventilated, or what is considered good ventilation, " viz., vertical shafts in each hatchway, connected at " the bottom either with a platform under the coal, " or with other shafts running fore and aft under the " coal alongside the keelsons or sometimes vertical " shafts only in each hatchway, whereas ships " belonging to the north, as a rule, have no through " ventilation, and they very rarely take fire. My " opinion is that north-country steam coal, under " ordinary circumstances, does not require through " ventilation, but that it is actually safer without it " for the following reasons, viz.—1st. The coal does " not contain sufficient gas to require any through " ventilation; 2nd. The coal when well cleaned does " not contain in itself anything to cause spontaneous " combustion; but if any pyrites should have been " overlooked in the cleansing, and is then subjected " to a heavy weight of coal passing on it, it is liable " to heat, and if a current of air can get at it from the " through ventilators, it might then ignite, and pro- " bably set the whole cargo in a blaze, which would " be effectually fanned from the ventilators, and the " ventilators themselves being usually made of dry " soft wood would probably be the first thing to " ignite. I would suggest that the ships should be " well ventilated above the coal only, that as many " ventilators through the deck-houses as can be con- " veniently fitted be well attended to, and that on all " possible opportunities the hatches should be kept " open. I submitted my reasons and my proposed " mode of ventilation to my friend the practical " chemist before sending them to you, and I have not " altered one word of my original copy. He said " what I stated is a great chemical fact, and not to be " disputed, and that the most effectual way to set a " ship on fire with the north-country steam coal is to " put in through ventilators, as it is scarcely possible " to avoid pyrites among the coal to a greater or less " extent. As to Howard's West Hartley being pecu- " liarly liable to spontaneous combustion, I am unable " to say. So many ships being burned at one time " looks suspicious; but then ships with other coal " have been burned at the same time—the 'Poco- " hontas' with Hasting's Hartley, the 'Susannah " Johanna' with Carr's Hartley, ships from Cardiff, " from Liverpool, from the Clyde, from Dundee, and " ships with general cargoes. It looks like an epide- " mic; and I fear the reason will have to be dis- " covered from other causes than from spontaneous " combustion. For many years very many ships, " and many of large size, have loaded this coal for the " company's Indian ports, and carried it safely. I " would respectfully suggest that this question be " submitted to some eminent practical chemist or " other authority for confirmation."

1203. (*Sir G. Elliot.*) You were speaking about the improved mode of loading the cargo by barrows with a ship like yours of 1,800 tons, would not it occupy a long time to load it in that way?—It does require a longer time, and costs more money.

1204. How long would it take to load an 1,800 tons ship?—The loading is not continuous. I do not know how long it would take to load an 1,800 tons ship; sometimes you have a great pressure of coal from the pits, and then you can have the three hatchways going; on other days you have only one hatch working, and so forth. I do not know how much they can load by barrows in a day.

1205. (*Mr. Duncan.*) You could load in about a week?—Yes, if you put plenty of hands on you could load 250 tons a day.

1206. (*Chairman.*) Loading at all the three hatchways?—Yes.

1207. (*Sir G. Elliot.*) Take Cardiff and other ports where coals are loaded; suppose that system were to be adopted, would it not take two or three times the amount of dock space?—At Cardiff the docks are so crowded, and the difficulty of getting your cargo in is so great, that I think it is quite an exceptional place as regards loading.

1208. Take the Northumberland dock; how long were they loading that 1,800 tons ship there?—I do not know; they were some days when they were not doing anything; it was done very quickly when they did get to work.

1209. Is not it a usual thing in the Northumberland Docks for a thousand-ton ship to go in and come out on the same tide?—Yes, I am aware that there is great rapidity in loading, but I think that at times there is a corresponding disadvantage; it may do for coasting voyages, but though there is great facility if you can get your ship under the tips and get her loaded right away, and though there is some saving, I think there are some disadvantages about it for long voyages.

1210. You think where you have long voyages and where the coals have a tendency to spontaneous combustion it might be in some measure guarded against by that more careful mode of packing them as compared with the rapid manner in which they are now loaded?—Unquestionably, of course the capabilites of the place must always be taken into consideration; the coal contractor at Cardiff may have several vessels loading at the same time, and sometimes your vessel may be waiting a fortnight or three weeks for a turn; and he may have three or four other vessels loading at the same time, and he may give you 500 tons a day, then a steamer may come in and you may be hauled out of your berth so that he may fill her up. It is not a question of a vessel going under the tips and getting her cargo right away at once. If they choose they could put 1,800 tons in a vessel in 48 hours. The practical result is that they ship a portion of the cargo very rapidly and then there is a stoppage for some time and that is where time is lost.

1211. If the coal at Cardiff were to be shipped in the manner you mention by barrows, it would take more than three or four times the area for the ships to lin in all the time that they would be detained?—Undoubtedly that would be required. I have loaded vessels on two or three occasions from Birkenhead by tips before I became alive to the advantage of the better mode of loading, and I have never had a heated cargo in a vessel going out of Birkenhead under either system.

1212. You have loaded by both tips and barrows at Birkenhead?—I have.

1213. And you have never had any heated cargoes from either mode of loading?—No.

1214. What is the advantage you attach to loading by barrows so far as Birkenhead is concerned?—Hitherto I have not done it voluntarily, I have done it because it was a stipulation in my charters that that mode of loading should be adopted in future, I shall always adopt it because I think the cargo is more equally distributed, the small coal does not get into a mass in the region of the main hatchway which is the locality where according to my experience fires usually take place.

1215. Your idea is that by shipping the coal as you do by barrows there is a partial ventilation on account of the roundness of the coal?—Yes, it does not get into a dense mass.

1216. Is not that rather against Mr. Steinson's opinion, that he thinks it is safer without any ventilation at all?—No, I think it corresponds rather with his theory of ventilation above the cargo, there is a great amount of natural ventilation that would give a current of air through. I asked the captain of the "Oliver Cromwell" whether his ventilator acted properly and he said that on several occasions he tested them by taking a piece of paper and tying it by the four corners with a piece of string and putting a pebble or something into it and dropping it down the ventilator, and said when he got it down a certain distance, he would

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let the stone fall out of it, and up would come the string and paper together showing that there was a strong draught through his ventilator.

1217. Those coals would be brought out of a mine at a temperature of about 55° and they would be put into the ship at a temperature of from 50° to 60°, that would be the temperature the coal would go in at; assuming that to be so, you put down those ventilators, you go to sea, and then when you get into the tropics you pass a current of air through this coal containing pyrites, perhaps, that current of air having a temperature of 130° or 140°, is that in your opinion calculated to help to ignite the coal?—I should think so, if the temperature of the atmosphere was much higher than that of the coal it would do so, but my opinion is that it would be very much cooler if you got a current of air than if you got a perfectly still atmosphere. A current going down through a ventilator like that would rather cool it than otherwise. When I have been down in the hold of a ship in the Tropics unless she has been very high out of the water, I have found it much cooler down below than up above.

1218. From your experience of over 17 years in shipping coal at Birkenhead where you have tried the two systems of loading, the one by barrows and the other by tipping, you have never had a single instance of heating?—I am giving my own experience as a shipowner.

1219. As a shipowner you have never gone to the Tyne except in the case of two shipments, and there you found that the mode of ventilation which seems to have been successful in protecting you at Birkenhead failed you in both instances when you carried the Tyne coal?—Quite so.

1220. (*Mr. Duncan.*) I suppose the necessity for shipment by barrows at Birkenhead would arise somewhat from the coals being wrought in much larger lumps than they are in the Tyne?—I imagine it is to ensure them being shipped in as big lumps as possible, to keep the coal in large masses, but I do not think it is a necessity arising from the coal being in large lumps when wrought, it is that the shippers of the coal, the Peninsula and Oriental and the Great Indian Peninsula, like it as much unbroken as possible. Taking it by barrows ensures its being shipped without getting too much broken. Then again I have frequently noticed (and my attention was particularly directed to it) that in loading the coal by barrows great care is taken to pick out every objectionable looking piece. I have seen at the end of a day's work a great pile of brassy looking lumps and slaty pieces all carefully taken out. Whether there is anything dangerous in those brassy looking lumbs I am not prepared to say. I imagine that they pick them out because they are not good to burn.

1221. You have probably seen coals loaded at the Northumberland Dock with an iron skid put down the hatchway to cause the coals to run to the side?—I was only there for a few hours when the ship was loading. I did not notice it particularly.

1222. In your judgment had the weather at the time the coals were shipped in the cases of the "Oliver Cromwell" and "Calcutta" any effect on the coals?—When I was in the Tyne in June when the "Oliver Cromwell" was loading, I think I remember there was a little drizzling rain, it was not actually dry weather, it was dull and cloudy weather.

1223. It was a dry summer altogether?—Yes, there was no rain to speak of.

1224. (*Mr. Ferguson.*) Do you know whether the coals put into those vessels that were burnt had been long out of the pits or not?—I have no knowledge upon that subject.

1225. Do you know whether in the cases of the shipments from Birkenhead any long interval has elapsed between the time of the coals being wrought and their shipment?—Sometimes they would be fresh wrought, and sometimes they would have remained sometime before being shipped. They have to come some distance by railway. I have known blockages on the line that have prevented our getting coal for some days, the colliery manager has said that it has left the pit but it has been detained in trucks on the line, and there it has been for days and days sometimes.

1226. Were all the ships that you have loaded from Birkenhead ventilated?—Yes, they were always ventilated in the same way.

1227. (*Dr. Percy.*) I think you spoke just now in favor of the system of loading by barrows on this ground, that there was not likely by that system to be the same accumulation in any one spot of small coal or slack?—Yes.

1228. Have you any reason to believe that spontaneous combustion is more likely to occur in an accumulation of fine coal than elsewhere?—The only reason I have for entertaining that opinion is that when coal is loaded by the tips I have always noticed a larger accumulation of small coal in the wake of the main hatch than at any other place, and speaking of the experience I have had in the cases of the "Oliver Cromwell" and the "Calcutta," in both those ships the seat of the fire was in that locality.

1229. Where the fine slack had accumulated?—Where the fine slack had accumulated, and I also asked Mr. Bates before my ships were burned what his information was as to where the fire took place, and he told me exactly in the same locality. An experienced ship-master with whom I was talking yesterday, who had been in ships that had been on fire, and had attended three surveys of ships that either came into Bombay on fire or had taken fire while lying there with coal, said that the fire in each case occurred about five feet from the skin of the ships in the region of the main hatchway.

1230. When there was an accumulation of fine slack?—Yes, that is what he attributed it to.

1231. You said that in the case of the Oliver Cromwell the men noticed an unpleasant smoky smell, which is said to be usual in coal-laden ships?—I did not say it is usual, but the apprentice assumed it to be usual in coal-laden ships. He treated it as quite a casual matter.

1232. (*Sir G. Elliot.*) The main hatchway would be where the ventilating shaft would be placed?—Yes, the ventilating shaft would come there.

1233. It was not merely that there was an accumulation of slack there, but that would be where the main shaft for the ventilator would be placed?—Yes, but the mass of small coal would be so dense that the ventilator would not act in the same way there as in the fore and after hatchways, where there would also be upright shafts.

1234. (*Mr. Abel.*) I gather from your evidence with regard to what you believe to be useful ventilation, that what you require is ventilation outside the mass of coal, so as to facilitate the escape of gas from the coals. Is that your opinion?—I cannot say that that is my opinion at all, because my opinion, based entirely upon my experience, is that the ventilation I have hitherto adopted with such success at Birkenhead is the proper veutilation for certain descriptions of coal; what the chemical ingredients may be in other coal which may require a different treatment I cannot say, as I have only had the experience of those two ships; but taking Birkenhead or Cardiff coal, I should adopt the same mode of ventilation that I have hitherto adopted successfully.

1235. Would the object of adopting that mode of ventilation be to guard against fire, or to guard against explosion?—It would be rather to satisfy my underwriters than to guard against anything; for I tell you candidly, that having been free from casualties, I simply adopted that which the underwriters, surveyors, and such like people recommended without looking at it critically or carefully at all. The first thing an underwriter says to you when you are insuring a cargo of coals is "Will your friends see, or will you see, to the ventilation?" They make a special point of seeing to the ventilation.

1236. (*Mr. Young.*) Have you any instructions to try the heat of the coals in the course of the voyage by the thermometer?—I never gave any pointed instructions till recently upon the subject, but I have always

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told the captains to keep their hatches off to prevent the possibility of an explosion. I have seen a casualty from Cardiff coal in particular arising from keeping the hatches on, but I never told our captains to use the thermometer till recently, though the ships have always been provided with thermometers for the purpose.

1237. Providing a thermometer would be a way of telling telling the captain that he ought to use it?—I should think so.

1238. Do you instruct them to record in the log the heat of the coal?—I do so now.

1239. You did not do so formerly?—No.

1240. If they have a wooden ventilator as you describe, how do they get the thermometer down into the mass of coal?—The sides of the ventilators are two-thirds open, like a venetian blind.

1241. Louvred?—Yes; and any gas or heat that is in the coal will naturally find its way through. By taking the state of the thermometer on deck, and then putting it down and keeping it down for a certain time, and then taking the temperature below, you get at the difference.

1242. I understand you to say that you have been a shipowner for 17 years?—Yes.

1243. Mainly in the East India trade?—Yes.

1244. Practically, your ships have always carried coals?—Yes.

1245. Have those burnings interfered with your trade recently?—Very seriously.

1246. How?—In the question of insurance. The rates of insurance on coal for long voyages are almost prohibitory, to some places entirely prohibitory; for instance, round to the west coast of South America, and to Japan, and those places, and even for shorter voyages from the Tyne, I have been debarred from replacing those two ships with similar vessels or (new colonial ships) simply on account of the amount of insurance. If you are tied to coal cargoes, the cost of insurance now as compared to what it used to be becomes a serious item.

1247. (*Chairman.*) Will you give us what used to be the rate, and what it is now?—For many years the rate I paid to take coals from Birkenhead to Bombay was 60*s.* to 3*l.* 3*s.* per cent.

1248. (*Mr. Young.*) On the hull of the ship?—On the hull of the ship.

1249. (*Chairman.*) And on the cargo, what was it?—About the same; I am speaking of colonial ships. On iron ships it would be lighter; it then rose to 80*s.* or four per cent., and subsequently to 90*s.* or four and a half per cent.

1250. Is that what it is now?—No, it is now 6*l.* 6*s.*, that is the minimum; I had to pay in the early part of the present year as much as 8*l.* 8*s.* per cent. to complete my insurance.

1251. Was that to Bombay?—In one case to Bombay, and in the other to the Madras coast.

1252. (*Mr. Young.*) Do you think that this state of affairs is causing the good class of ships to fall into disuse, and bringing in a lower class of ships?—It is certainly deterring a great number of people from putting them into their high class ships.

1253. The result would be that inferior vessels would be bought for the purpose of carrying coals on those long voyages, the owner probably not insuring them at all?—I have been seriously contemplating doing that within the last 10 days. I have been talking the matter over with my friends, whether it would not be better worth our while to have good sound older ships which are of comparatively little value for the carriage of coal, and take our own risk rather than pay those prohibitory rates, whether it would not be better to take a vessel of 7,000*l.*, or 8,000*l.*, or 9,000*l.* value, and divide it into fourths among my friends, and taking $\frac{1}{4}$ instead of $\frac{1}{2}$, and running my own risk.

1254. That arises practically from the opening of the Suez Canal, and from the fact that ships do not get any outward cargo except coals?—Except coals and salt.

1255. (*Mr. Duncan.*) You find not only that the premium has increased so enormously, but that many underwriters will not take coal ships at any price?—The area of insurance on ships loaded with coal has been limited to an extent that I have never seen in my 25 years' experience, some underwriters decline them entirely; they will not look at them.

1256. (*Mr. Icely.*) You have informed the Commission that in the case of the "Oliver Cromwell" the coal was very small?—It was.

1257. That was your ship?—Yes.

1258. It was not your cargo?—No.

1259. Therefore it was not to your interest to see that the coal was shipped in good condition?—No; I took the coal as it came.

1260. Was that coal inspected?—Yes, I think so; I may say that I did not see the whole of the cargo; it was only what I saw when the ship was half loaded; I saw a dense mass of coal in the region of the main hatchway. I imagine the Peninsular and Oriental Company had their inspector there.

1261. This was for the Peninsular and Oriental Company?—Yes.

1262. In the case of the "Corah" the cargo was also for the Peninsular and Oriental Company?—Yes.

1263. She arrived safely?—Yes.

1264. In the case of the "Oliver Cromwell" the cargo ignited?—Yes.

1265. (*Mr. Fenwick.*) Do you know what quantity of coal the "Corah" had in her?—I should think from her size she must have had about 2,000 tons.

1266. The vessel was not ventilated?—She was not ventilated.

1267. You say that from your adoption of the mode of ventilation which you have adopted in the case of vessels sailing from Birkenhead, you have been kept free from accidents in ships going from Birkenhead?—I am not prepared to assert that that has been the cause of my having no burnings; but I have ventilated the ships, and I have had no burnings and no heated cargoes.

1268. That mode of ventilation has been successful in Birkenhead, but it has not been so in the Tyne. From your experience, supposing you were loading coal in the Tyne, would you ventilate your ships in the same manner as you do at Birkenhead?—I would move my ships to any part of the coast sooner than send them to the Tyne. If I had a ship at Dundee, I would send her round in ballast to Liverpool rather than go to the Tyne, because it is prejudicial to one's business and status to be losing one's ship, though the cause is ascertained, and it is proved, that you are not to blame. I have had sufficient casualties and I do not want any more.

1269. Still the fact remains that the other vessel, to which you referred, that was not ventilated, arrived at port without any accident?—Yes; but a burnt child dreads the fire. I do not want to try any more experiments with Tyne coal.

1270. (*Mr. Cory.*) I understood you to say that you were now contemplating arrangements for taking your own insurance risk?—Yes; it is passing through my mind.

1271. Are you under the impression that there is rather an unjustifiable panic amongst the underwriters and that they are charging too much?—I would put it in this way; they are not discriminating, they are panic struck as regards every port, but particularly so as regards the Tyne. They are not putting a differential rate on the different ports as they ought to do, taking into consideration the number of casualties in vessels sailing from one port as compared with vessels sailing from other ports.

1272. Have not the premiums gone on increasing on other risks besides those on coal laden ships?—Not to anything like the same extent.

1273. But to some extent?—On some voyages they have; on some risks they are very much lower.

1274. Lower than they were five or six years ago?—Yes, unquestionably; you may take it thus; that in a business like coals or rough cargoes, generally the rates are higher; but on those things which the

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underwriters have lost enormously, such as steamers through the Suez Canal and on goods coming from Calcutta, they are decidedly lower than they were some years ago. Directly we get a rough risk, that is to say, a rough cargo, coals or salt in a wooden ship, the underwriters do not care to name a rate, but particularly when we get coals.

1275. (*Mr. Vivian.*) Do you attribute the immunity from accident in the case of coal shipped from Birkenhead to the character of the coal or to the ventilation which you adopted?—I am inclined to think that it is a great deal more from the character of the coal than anything else.

1276. Have you known cargoes of coal from Birkenhead which were not ventilated take fire?—I do not know whether they have been ventilated or not, but I had recently through my hands a list of 834 coal-laden ships that sailed in 1872, 1873, and 1874 from Birkenhead to all parts of the world, a large number of them to the East. I put that list in the hands of the secretary of Lloyd's and asked him to have the books and records of Lloyd's searched and to give me the results of the voyages of those vessels. Some of the 1874 voyages were not then ended, but the result as far as I remember was this, that out of the 834 ships there were only three known to have been burnt, or supposed to have been burnt, and five missing.

1277. Or they may have foundered?—Yes, it was three or four months ago that that came before me. Therefore I am bound to consider with such a large number of ships, and such a small per-centage of burnings, there must be something in the coal itself.

1278. Have you had any experience of shipment at Cardiff?—I have had some experience, but nothing like the experience I have had at Birkenhead.

1279. Would you ventilate Cardiff coal, or would you not ventilate it?—I always have ventilated Cardiff coal when I have shipped it.

1280. Have you had any cases of spontaneous combustion from coal shipped at Cardiff?—No, not as a shipowner.

1281. Have you shipped any unventilated coals from Cardiff?—Never.

1282. Do you know of any unventilated coals having been shipped from Cardiff?—I do not.

1283. You said that the fires chiefly occur in the main hatchway, and you attribute it to the smallness of the coal in the hatchway?—Yes, to the density of the mass.

1284. It is customary, is it not, to load coal at the other hatchways as well as the main hatchway?—Yes, they trim the cargo in that way; when they cannot trim it by hand easily, they move the ship to load the coal at the ends.

1285. Ships constantly take coal on board at all the hatchways, do they not?—Yes.

1286. Why do you think that the coal becomes more liable to spontaneous combustion at the main hatchway than at other hatchways?—From the facts that have come before me I have found that it is in that direction the fires occur; the great bulk of the cargo goes in at the main hatchway; it is only a small proportion that goes in at the other hatchways.

1287. Have you ever shipped coal or taken coal on board under the box drops?—I cannot call to mind that I have.

1288. I presume your reason for preferring barrows to tips is chiefly from the breakage of the coal in the hatchway itself?—No, I have no interest in the breakage except the cargo is my own, and even then very little, because it is generally sold on the endorsement on the bill of lading. One of my preferences for the barrow system is founded on this, if you are loading by tips sometimes if the captain is away they will carelessly put in too much at one end, and the ship will strain herself, whereas when you are loading by barrows you can wheel them where required so as to trim the ship exactly as you want.

1289. That applies to the trimming of the ship. I am speaking of the liability to spontaneous combustion and the production of small coal; supposing small coal were not introduced into the hatchway by the adoption of another system of shipment, namely, by the box system, would that remove your objection to shipment by tips?—Next to the system of loading by barrows I should prefer the coal being loaded in boxes in the way you speak of.

1290. I presume when a column is once formed in the hatchway the liability to produce small coal is no longer so great?—I have always seen it come up in a pinnacle of small coal to the very top, and as long as there is room for it to run clear of the hatchways the big lumps of coal run down and the small coal generally culminates.

1291. After that there is not the same liability to breakage?—There is not the same liability to breakage.

1292. So if you formed your column in the hatchway by boxes and then used the tips the difficulty you have mentioned would be got over?—It would be got over to some extent certainly.

1293. (*Chairman.*) Your evidence has only gone to the shipment of steam coal, have you had any experience in the shipment of smithy coal or any other coal?—Nothing to speak of. The firm with which I was connected used to ship smithy coal largely to Bombay as merchants, and we never had any accident with it.

1294. Your evidence hitherto has been only as a shipowner, I believe you have been an insurance broker also?—Yes.

1295. Have you had any experience as an insurance broker with regard to this question?—I have had 25 years' experience as an insurance broker in London.

1296. Have you had any experience on this particular question, have you had any experience of cases of combustion in ships which you have insured?—Yes.

1297. Could you give us an outline of that experience?—I have not gone back many years because one's memory is treacherous upon these things, but in October 1867 I insured a ship called the "Sir George Seymour" from Birkenhead to Bombay, in which ship spontaneous combustion took place; that is the only case of burning in a vessel sailing from Birkenhead that has ever passed through my hands in my 25 years' experience, insuring coal to all parts of the world, or that I have known. In October and November 1871 I insured for two different owners a portion of the value of the ships the "Sea Pink" (a colonial ship,) and the "Baringa" (an iron high-class ship). Both loaded from the Tyne and both sailed for Bombay and neither of them was ever heard of; being well formed ships and well owned ships, the conclusion in my mind always has been that they were burnt.

1298. Do you know what the name of the coal was?—No, I do not. I am under the impression that I have seen in a parliamentary paper a list in which those two ships are included, where the name of the coal is given. So, assuming that those two missing ships were burnt, my experience embraces five ships, one of which was from Birkenhead, and four from the Tyne.

1299. You have been concerned with considerably more ships from Birkenhead than from the Tyne?—As an owner.

1300. And also as an insurance broker?—Of late years I have been more concerned with ships from Birkenhead, but previously from the Tyne also.

1301. A large number of them being coal ships?—Yes, to all parts of the world.

1302. You spoke of the rate of insurance having very much risen on coal. Does that high rate maintain itself at the present moment; has there been no fall lately in the rate since coal fell in value?—I have not perceived it; on the contrary, I have found increasing difficulties. For instance, if you have a ship going out of Birkenhead valued at 5,000*l.* you can find an area of underwriters for that vessel at say, taking Bombay, 6*l.* 6*s.* per cent., but if you have a ship of 15,000*l.* value you either have to send to Land's End, or John o'Groats, or to Paris for insurances before you can get

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such an amount as that insured, except you pay an enormous premium.

1303. Are you speaking of coal ships?—Yes.

1304. You said you had an idea of ceasing to insure your coal ships and of spreading the risk among a limited number of friends. Would not you in such a case have very much higher wages to pay?—No the sailors never question whether you are insured or not. I should think if anything I ought to pay lower wages; they would infer that my ship was so well found that I was prepared to take the risk of her.

1305. It would not be an objection to the ship?—No, on the contrary, I think the minds of people would be operated on by the fact that the owner has so much confidence in his ship that he will not insure her.

1306. (*Mr Fenwick.*) You have mentioned five cases where the ships have been lost or not heard of, can you inform us how many ships you have insured in your experience?—I cannot; it must have been a great many.

1307. Having the great experience you have, and having insured so large a number of ships, it would be very desirable if you could tell us approximately the enormous amount you have insured as compared with the five vessels that have been lost?—Having paid as much as 60,000*l.* in some years for premiums, and 40,000*l.* perhaps on the average for the last 20 years, I must have had to do with a great many coal ships in my time. Some of the ships would be only loaded partly with coals.

1308. (*Chairman.*) You have had a hand in insuring hundreds of coal ships a year?—In some years, certainly.

The witness withdrew.

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MR. ROBERT JOHN HANCOCK examined.

1309. (*Chairman.*) You are a Bristol merchant, I believe?—I am shipping manager to Messrs. Charles Hill and Sons of Bristol and Cardiff.

1310. You have had great experience in connexion with the shipping of coal?—I have had many years experience in it.

1311. You have been concerned in shipping many thousand tons of coal, I believe?—I have shipped about 75,000 tons of coal during the last ten years.

1312. What coal has that been chiefly?—All the various kinds of steam coal shipped from Cardiff and Newport. I could not give you the names of the pits. I have also shipped several cargoes of smelting coals.

1313. Have you had any cases of spontaneous combustion or explosion?—We have never had a case of explosion. We have had one case, not of actual spontaneous combustion, but of coals becoming very much heated. That occurred in the case of a ship called "Her Royal Highness." The captain, fearing to go on to Cape Horn with them, sold the coals at Monte Video, finding that the expense of landing them and re-shipping them would be more than they were worth.

1314. That is the only case within your experience?—Yes.

1315. That being so, what precautions do you take with respect to ventilation, or with respect to the shipping of your coals?—We always carry our coals on a platform from 16 to 20 inches from the bottom of the ship, so that there is always a cool place, and then the bottom of the coals does not get wet. I think wet is a great cause of spontaneous combustion.

1316. Have you any special ventilation? Have you any ventilators up to the hatchways?—We put iron ventilators as far forward as we can get them, and as far aft as we can get them, down through the poop. We put a ventilator in each hatchway.

1317. Is your experience that that system of ventilation is sound?—I can only judge from our ship's having gone free from accident.

1318. Have you compared your immunity from accident with the casualties of others?—Only in a general way. I know that a great many of the ships that have been burnt have carried their coals upon the bare skin of the ship, and that they were very often wet at starting.

1319. I understand you to say that you would recommend that all coals should be carried on a platform?—Yes.

1320. Have you any recommendation to make with respect to the manner of taking coal on board?—I think if it were possible to take only large coal on board at first, so as to have in each hatchway a good pile of large coal, and no small coal, it would to a great extent tend to prevent spontaneous combustion.

1321. How has the coal generally been shipped in the ships of which you have had experience?—By tips.

1322. Always by tips?—Yes.

1323. You have had no experience of the system of lowering by barrows?—None whatever.

1324. And yet you say that your coal has been remarkably free from accident arising from spontaneous combustion?—Yes, I think I can fully account for the near approach to accident in the ship I have mentioned. She was a new vessel, and very flat in her bottom, and in putting the platform in, which we do as much to ease the ship as for ventilation purposes, we kept it as high as we thought she would bear it, and after she had been at sea a few days they found that she was top heavy. They took her back to Cardiff, and discharged part of the coals, and while the coals were lying on shore it rained very heavily, and the coals got wet. They took 600 or 700 tons out of the middle of her, and took up the platform; and when they put the coals in again they let them run down on to the bottom. I think that fully accounted for their heating, and I further think that if she had gone out with the original platform no accident would have happened.

1325. Do you think that that accident arose from the coal getting wet, or because there was no platform at the bottom of the ship, and consequently no ventilation?—Both combined I think tended to produce the heating.

1326. Was there any special report sent to you of the chemical cause of the combustion; was any special survey held?—No. We always instruct the master to ascertain the heat of the hold with the thermometer; in doing this the captain stated that he found the hold getting gradually heated, and at last he took the main hatches off and forced iron bars through the coals as far as he could get them, and on withdrawing the bars they were so heated that a match would ignite against them; he then felt satisfied that the coals were very near ignition, and he ran back to Monte Video.

1327. Was there any suggestion that there was much iron pyrites in the coal?—No; but I have always understood that that is the cause of spontaneous combustion; this cargo that I am speaking of was smelting coal.

1328. Do you know what the coal was? Do you know from what pit it came?—No; it was shipped at Cardiff for Messrs. Henry Bath and Son, of Swansea; it was a cargo of 1,800 tons.

1329. So that in all your experience of coal shipped from the tips, you have been entirely free from casualty, except in a single case where the platform which you uniformly insist upon had been taken up, and where the coal remained on the bottom of the ship?—Yes.

1330. And you attribute that one casualty to the neglect of that precaution?—I do, entirely.

1331. (*Mr. Vivian.*) Have you ever shipped coal by box drops, where the box is lowered through the hatchway?—Yes; at the commencement sometimes they are used in putting the first part of the cargo in.

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1332. Do you consider that system a good one?—I think it must tend to lessen the force of the fall; the impact would be less in the bottom of the ship.

1333. You said that you preferred the main hatchway being filled up with large coal?—I think it would tend very much to reduce the tendency to spontaneous combustion if care were taken in stowing the first portion of the cargo by putting in large coal.

1334. In shipping by the box you would attain that end?—To a certain extent; the box is not lowered down the entire depth; you have a fall, perhaps, of 14 feet.

1335. The box is lowered frequently through the hatchway, is it not?—I have never seen it lowered down to the bottom.

1336. Do you know the system adopted in the Alexandra Docks, at Newport?—I was there the other day; we have a ship loading there. I saw that they had a new system, but I had not an opportunity of seeing it at work.

1337. (*Mr. Fenwick.*) You say that in all your vessels you have this platform at the bottom?—Yes.

1338. Is that plan generally adopted among shipowners?—Most vessels in the Callao trade have platforms for carrying guano cargoes.

1339. Is this platform erected solely for the purpose of ventilation, or for the purpose of raising the cargo up off the bottom?—It is erected for the purpose of raising the cargo off the bottom, and also for the purpose of ventilation. I have here a sketch of it (*handing it in*).

1340. I understand that the platform is put in chiefly for your return cargo?—Not necessarily; in going to India we always put those platforms under the coals, and we then take them up and make dunnage of them for stowing the homeward cargo.

1341. Is it your impressson that it is very desirable that the coal should be kept free from wet?—I think it is very desirable. I know there is great carelessness in loading coal; people treat it the same as ballast almost, and they very often allow the rain to go down the hatchways.

1342. You appear to think it very important that there should be large coals in the hatchway; why do you advocate the stowing of large coals in the hatchway?—Because I think the danger of spontaneous combustion arises from the small coal. I do not think if large nobs were stowed in by hand there would be any such thing as spontaneous combustion. I think the fire generally takes place in the hatchways underneath the drop.

1343. (*Mr. Icely.*) What is the quantity of coal that you think you superintend the shipment of yearly?—Some years it is considerably more than others; last year we took a great deal of iron out. I have shipped 75,000 tons in 10 years; some years it has been 7,500 tons; in some years double that; and in some years it has not been so much.

1344. At what period was it that you had this one casualty that you speak of?—It was in 1865.

1345. During the whole of the 10 years you have had but that one casualty?—That is the only one.

1346. Have you during the whole of those 10 years had your ships ventilated?—We have had them ventilated in the manner I have spoken of, never otherwise.

1347. Have you been in the habit of taking the temperature of the cargoes?—The captains have been instructed in a general way to watch by the thermometer if there is any heating in the hold, and to keep the hatches off in fine weather.

1348. Are they instructed to try the temperature at any specified period?—They have not been so instructed.

1349. They have been left to exercise their own judgment?—Yes; I think in future I shall direct the captains to record the temperature in the ventilators of each hatchway in the log-book at noon daily.

1350. (*Mr. Young.*) You have stated that you have shipped 75,000 tons of coal in 10 years, that would be 50 or 60 cargoes, I suppose?—68 cargoes; some of the cargoes have reached 2,200 tons; we had one cargo last year, which we sent on our own account to India, which was on board for six months before it was sold.

1351. (*Dr. Percy.*) You spoke of the importance of protecting coal from wet; what reason have you for believing that moisture renders the coal more likely to ignite spontaneously?—Our only accident is one reason, and I gather that that is the opinion of people who are constantly shipping coals and also of coal owners.

1352. Is it an impression simply, or can you give any well-established facts in justification of that opinion?—The only fact I can speak to is our own approach to an accident.

1353. You say the fire generally occurs underneath the drop—is that the place where the fine coal is likely to accumulate?—Yes.

1354. (*Mr. Ferguson.*) With regard to your vessel that took fire, was it ascertained that water had got on to the coals in the voyage out?—She made some water in the top sides, but the coals were very wet when they were reshipped.

1355. (*Mr. Duncan.*) It would be the water they got on shore, rather than from any water that they got in the ship that you would attribute the heating to?—I think so.

1356. Therefore the platform in that case would not have very much to do with it?—Only if there were no platform there would not be the advantage of the cool air under the platform, and the coals could not drain if they had any moisture in them.

1357. Did you have a shaft up from the platform?—Yes; up each hatchway.

1358. You had no ventilation among the coals by the side of the keelson or otherwise, above the platform?—No.

1359. (*Chairman.*) You said that of late you have paid more attention to this question of spontaneous combustion of coal than formerly, and that you give more specific instructions to your captains?—Some years ago accidents rarely occurred, but since they have been more numerous we have instructed the captains to see that the ventilators are kept clear during the loading.

1360. Though you have not lost a ship during 10 years from spontaneous combustion, the question has assumed greater proportions lately?—There have been a great number of accidents, but whether they are greater in proportion to the amount of coals carried or not I do not know.

1361. At any rate, your attention has been drawn to it more prominently lately?—Yes.

1362. The Chamber of Commerce of Cardiff has taken great pains with regard to this question?—Yes.

1363. Were you one of those who took part in the inquiry they made?—Only in connexion with Mr. Hill. I am frequently in Cardiff, and he and I have talked this matter over together; he is president of the Chamber of Commerce of Cardiff.

1364. As president of the Chamber of Commerce of Cardiff, with your assistance, he has gone a good deal into this question?—Yes; he has furnished some statistics of the number of vessels lost.

1365. Am I right in saying that you are acquainted with the statistics which Mr. Hill has prepared?—I have seen them. I saw them before they were printed.

1366. Did Mr. Hill consult you in the preparation of those statistics?—He was about them when I went to Cardiff, and they were put before me. I went over several figures with him.

1367. Is the result of the inquiries made by your firm, which Mr. Hill in his capacity of president of the Chamber of Commerce has put forward, that the per-centage of loss by spontaneous combustion, whether measured by ship or measured by the quantity of coal, is not over one half per cent.?—That is shown in this statement.

1368. That is over the whole kingdom?—Yes, that is the result as shown by the statistics published up to October last.

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1369. On the subject of ventilation, is it the result of those inquiries that ventilation is very dangerous to one class of coal, and very necessary for another?—I do not think ventilation could be dangerous in any coal, but after a fire once occurred no doubt the ventilators would tend to feed it. I do not think ventilators would tend to cause the fire.

1370. Do you know whether there is any increase in the premium which is now charged on these risks?—I know that we pay very little more.

1371. Can you recollect what you used to pay?—I do not think that we are paying any more than we did seven or eight years ago.

1372. Is that because you have been so remarkably free from accident?—I take it that it is because we have been free from accident, and go to the same underwriters, and because we take a large amount of the risk ourselves.

1373. Your experience is that the rates of premiums on your coal-laden ships are pretty much what they used to be?—We do not pay more than one per cent. over, we should not pay more than one per cent. extra in taking a coal cargo as compared with any other cargo. I am speaking of voyages round the Capes for instance. We take a third of the risk always ourselves.

1374. Where are your risks taken?—In London.

1375. At Lloyd's or by companies?—Partly at Lloyd's and partly by companies.

1376. (*Mr. Fenwick.*) Is it the fact that you do not pay more than one per cent. more than you paid seven or eight years ago?—I may say positively that we do not.

1377. (*Mr. Duncan.*) Are any of your ships loaded with a general cargo from London?—Yes.

1378. What would be the premium on a ship loaded at Cardiff with a general cargo?—35*s.*

1379. What is the premium when you load the same ship with coals?—Coals to India would be higher at any time. When I said the premiums were not higher I should have said as compared with any other heavy cargo; the difference between the premium on a general cargo and the premium on a cargo of coals that we used to pay, did not arise so much from the danger of spontaneous combustion as from the weight. The underwriters prefer a general cargo to a weighty cargo. We do not pay more than one per cent. for coals over what we used to pay.

1380. That is to say, you are speaking of your Bristol Channel cargoes, machinery, and so on?—Yes.

In 1866–7 we paid on good colonial built ships with coals from Cardiff to the west coast of America - -	90*s.* to 105*s.*
And on similar vessels with salt to Calcutta - - - -	80*s.*
And with coal to Calcutta - -	84*s.*
In 1873–4–5 we paid on same class of ships with iron and machinery cargoes to West Coast of America - -	80*s.*
And with coals from Cardiff to ditto -	90*s.* to 105*s.*
One new colonial ship with 2,000 tons coals Cardiff to Valparaiso, was insured at - - - -	60*s.*
In 1874, on a colonial ship 9 years old, with coals, Cardiff to Cape of Good Hope, Galle, and a port of discharge in India we paid - - -	110*s.*

Most of these rates includes shifting to a loading port in England, or on to the Guano Islands after discharge of the outward cargoes.

The witness withdrew.

Mr. T. Beynon.

MR. THOMAS BEYNON examined.

1381. (*Chairman.*) You are a magistrate at Newport?—I am.

1382. What is your business?—I am a shipowner and coal merchant.

1383. I think you have had considerable experience in the shipment of coal?—Yes.

1384. Spread over a good many years?—15 years.

1385. Could you give the Commissioners roughly any idea of the number of cargoes you have been concerned in shipping?—I shipped perhaps 80,000 tons last year.

1386. In the course of your experience you have had several cases of spontaneous combustion at sea?—I have had one case in one of my own vessels, and two cases came under my jurisdiction as a magistrate, the "Minnie Graham" and the "Herbert Graham."

1387. The ship of your own that suffered in this way was the "Usk?"—Yes.

1388. We will take that first; in what year did the casualty happen?—She was a bark of 338 tons register, and she loaded a cargo of smelting coals at Swansea. That was in the year 1861.

1389. Was that cargo taken on board under favourable circumstances?—The weather was wet when the coal was shipped.

1390. How was the coal put on board?—The wagons were tipped into the shoot. The shoot rested on the ship's combings leading to the hold. The wagon was tipped up and it was eased off by the wing. The fall was gentle and the coal fell nearly perpendicularly.

1391. You say the weather was wet?—Yes, and the coal was wet, no doubt.

1392. What ventilation had you in that ship?—There were four pieces of wood running along very near the ship's bottom, and crossed with battens, and from this main shaft, as I may call it, there were similar shafts coming up through each hatchway.

1393. Was this a sort of a platform?—No, it was a kind of square pipe running through the ship, battened over.

1394. About how broad was it?—It was about 14 inches square, and there were shafts of the same description coming up through each hatchway.

1395. It would not protect the coal from wet if there was any wet in the ship's bottom?—No; personally, I have no faith at all in the ventilation of smelting coals.

1396. Do you know from what pit this coal came?—I do not know. It was the usual smelting coal. It was shipped by Messrs. Bath and Sons.

1397. How long had the ship been out?—88 days. They were 200 miles south of Valparaiso when they first discovered it.

1398. Were there any circumstances of special note in the way it was discovered?—The men complained one morning of great heat in the forecastle. The captain went down, and on opening the forehatches, a flame burst up as high as the foretop, and they immediately abandoned the ship. They had to get out a boat before the rigging was destroyed.

1399. They saved themselves?—They were picked up two days afterwards.

1400. This occurred about 14 years ago?—About 14 years ago. There is one circumstance connected with that ship that I would like to mention as showing the difficulty in accounting for spontaneous combustion. On the previous voyage she loaded a similar cargo precisely at Swansea; the captain went out, and having got as far as Cape Horn, he brought the ship right back to Newport, and he said that the Almighty had come on board at Cape Horn and warned him not to go any further. I came up to see the underwriters and they said they did not think they were bound to carry on the insurance, but looking at the circumstances of the case they would do so, but they asked me to discharge the ship so as to see whether the coals were heated. I discharged the coals out of the main hatchway, and the coal was thoroughly cool from top to bottom, and the ship went out and discharged her cargo with perfect safety.

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1401. It was not commanded by the same captain after?—No.

1402. That is 14 years ago, and that is the only instance of spontaneous combustion that you have had in your own ships?—Yes.

1403. Was there any inquiry in that case?—None whatever.

1404. The other two cases you have mentioned are the "Herbert Graham" and the "Minnie Graham?" Yes.

1405. And those came before you as a magistrate?—Yes.

1406. You were one of the members of the court of inquiry?—Mr. Hewertson, the then mayor, and myself were the magistrates.

1407. We have the minutes of the inquiry before us, but will you give shortly the leading features in each of those cases and state the impression they produced upon your mind?—Samples of the coals were produced in court similar to that with which the ships were loaded; they seemed to have come from several mines; they appeared to be an inferior sort of coals altogether.

1408. Those casualties occurred at the end of 1873?—Yes.

1409. Will you first take the case of the "Herbert Graham;" that inquiry I believe you held in the early part of 1874?—Yes. She left Newport, I see, on the 1st July 1873.

1410. How long was she out?—From recollection, I think about 100 days.

1411. What coal had she on board?—She had coal from different mines; it seemed to have contained a great deal of iron pyrites.

1412. Was it all steam coal?—It was all smelting coal; what we call house coal at Newport.

1413. Where was she bound to?—To Valparaiso.

1414. Do you remember how she was ventilated?—No, I cannot say.

1415. What impression did the inquiry produce upon your mind as to the cause of the casualty?—The impression that the inquiry produced upon my mind was that the coal was small, containing great quantities of iron pyrites, and I think it was shipped when the weather was wet.

1416. Do you remember how it was shipped?—By the tip, something similar to the mode I described in the case of the "Usk."

1417. Was it stated in evidence that the coal must have been wet?—I think it was. I think it was so stated in the evidence of the shipper.

1418. Then is it your impression that the system of shipping by tip is objectionable?—No, I do not think it is. I do not think you could find a better mode of shipping coals than that.

1419. Then what precaution do you think was omitted in the case of the "Herbert Graham"?—I do not think there was any precaution omitted at all, I believe it is only a question of time when such coals will take fire. If a cargo of smelting coal were shipped under the same conditions you could calculate almost to a day when they would take fire.

1420. What do you mean by the same conditions?—If similar coal was shipped damp.

1421. Your opinion is that smelting coal if shipped damp will to a certainty fire after a certain time?—I think it is almost inevitable unless it is shipped in a different manner than shipping it in bulk.

1422. And your opinion is that no method of ventilation will guard against casualty in the carriage of such a cargo shipped under those conditions?—I think not, because the coal is so small and it gets so hard that ventilation would be useless; it would not penetrate through the cargo.

1423. All that you recommend is that greater precautions should be taken to ship the coal dry?—Further than that, I would recommend that the coal should be shipped in casks or barrels. I think that would be a sure preventative against spontaneous combustion.

1424. You would advise that it should be made a law or regulation to ship all smelting coals going to a great distance in cask or barrels?—Yes, it does not follow that they should be very sound barrels; the object would be to isolate the coals by separating them into small quantities. I believe that shipping the coals in barrels would be a sure preventative. In the case of the "Herbert Graham" the chemist that came down from the Board of Trade (Mr. Vassard) stated that carbonic acid or sulphurous acid, I forget which, if generated in proper quantities and introduced into the hold of a ship on fire from spontaneous comoustion would put out the fire, and he put before us a very elaborate plan of introducing pipes into a ship's hold, running fore and aft in the sides and in the centre of the ship and they were to be perforated. We knew when the inquiry was finished that the "Minnie Graham" had been lost, and he stated that if the inquiry on the loss of that vessel was held in Newport he would bring his apparatus down and show us the manner in which he proposed to put the fire out.

1425. Was the "Minnie Graham" lost about the same time?—She was lost a little after. They were both loaded in Newport with the same coal, and they were both lost under similar circumstances.

1426. I understand you to say that in both cases the coal was shipped damp?—I think it is in evidence that the coal was shipped damp.

1427. Did this gentleman bring his apparatus down?—He did, and during the inquiry he got a large fire made up in the court house, and he got a piece of wood to fit the front of the fire to prevent the air getting into it, he got his gas made and introduced it into the fire, but he nearly set fire to the court house; he did not put the fire out.

1428. Do you mean it was his recommendation that all ships carrying smelting coal or house coal to distant places should be obliged to be fitted up with this special machinery?—He recommended this system and I have no doubt it might answer if the air was totally excluded. I do not know whether it would or not; but I mentioned to him my method of stowing the cargo in casks and he agreed with me.

1429. The members of the court of inquiry did not endorse his recommendation?—Not under the circumstances, we had to put the fire out.

1430. I take it that your judgment is, so far as your experience enables you to give an opinion, that all that is required to be done in the case of smelting and house coal going on a very long voyage is to ship it in casks?—I think all coal liable to spontaneous combustion, that is to say, containing iron pyrites and shipped in damp weather ought to be shipped in casks.

1431. Would you extend that to steam coal?—No, I have never seen a well authenticated account of pure South Wales steam coal taking fire by spontaneous combustion.

1432. Do you know of any cases of spontaneous combustion in north country coal?—No, but I know that during the high prices in South Wales they shipped coals as steam coals that were not steam coals, and some of the ships carrying those coals took fire. I do not think that a cargo of South Wales first-class steam coals would take care by spontaneous combustion.

1433. Would you apply a different mode of ventilation to steam coal from that which you would apply to smelting coal?—I have always found in loading my ships with steam coals that if I keep the hatches off for a certain time after they are loaded it is a sufficient safeguard, and if a ventilator is introduced through the poop into the hold and another through the other hatchway it will carry off all the gases.

1434. Without any longitudinal method of ventilation?—Yes.

1435. To keep the surface of the coal well ventilated?—To keep the surface of the coal well ventilated, and I should allow no one to go into the hold without a safety lamp.

1436. That is more to guard against explosion?—Yes.

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1437. From your experience those are the recommendations which you would give to the Commissioners?—Yes, I believe what I propose would be a sure preventative, and a very trifling matter of expense.

1438. Have you any other suggestion to make of the same character?—I feel so convinced in my own mind that the precautions I have suggested would be a preventative that I do not think any other precaution would be necessary.

1439. Would it be your advice that those precautions should be matters of law or would you leave it to the interest of the merchant to adopt them?—I am very much adverse to compulsory legislation. I think it might be left to the intelligence of the underwriters and shipowners if the underwriters say we will not insure a ship under a certain premium unless the coal is shipped in casks that would meet the case I should think, but if it would not I would rather see a compulsion for the sake of insuring safety.

1440. You would trust in the first instance to the publicity which perhaps the report of this Commission might give to some desirable rule than make it a question of Parliamentary enactment?—I think so at first.

1441. Have you any information to give us with regard to the present premiums that are charged on the shipment of coals from your part of South Wales?—It would depend on the ships. I should think that the premiums paid on ships going out with coals from South Wales to the west coast and coming back with nitrate would be 100*s.* per cent. if the owners are known to the underwriters.

1442. Has there been any change during the last few years?—The tendency is for premiums to go up especially on coal-laden ships; upon a ship which has just gone out from the north I had to pay 10 per cent. on her passage outwards—that was from Sunderland to Calderan.

1443. Was she a good ship?—She was a good ship because I ensured her at 80*s.* on the previous trip on the round.

1444. Was that with a coal cargo?—Yes, it was smelting coal from Newcastle in each case.

1445. Have you had any casualty from fire in ships of your own sailing from the north?—No.

1446. Is it your experience so far as South Wales is concerned that there has not been any serious rise in the premiums charged on good coal ships?—I have not insured a ship since the late losses, but I think the underwriters charge more on ships carrying coals to the west coast of South America.

1447. Both from South Wales and the north?—Yes.

1448. You have not had to insure a ship yourself lately?—Only one from the north.

1449. You have not had to insure a ship yourself from South Wales?—Not since the inquiries into the loss of those ships—not since the early part of 1874.

1450. (*Mr. Vivian.*) You say you consider that smelting coal will always take fire; do you mean that all sorts of smelting coal are liable to spontaneous combustion?—The common smelting coal that contains iron pyrites I think is very liable to take fire if it gets damp, but about the same time that the "Minnie Graham" and the "Herbert Graham" were loaded at Newport, I loaded a ship with steam coal mixed with large coal. I put two trucks of small coal to one of large coal. She went out to Coquimbo; it was Monmouthshire coal, which is a semi-bituminous coal; and I had a letter from the company to whom I sold the cargo in which they said it was the finest smelting coal they had ever had, and it turned out perfectly cool. It was in the proportion of two trucks of small coal to one truck of large coal.

1451. What coal was that?—A coal called the Tilleary coal; we shipped it as Beynon's black vein smelting coal.

1452. That is a case of smelting coal not liable to spontaneous combustion?—There was no casualty in that case. It was what they term a pure smelting coal. It was an experiment on our part. We recommended the coal, and it turned out equally good coal as the other. I suppose being a pure steam coal it did not contain so much iron pyrites.

1453. Very large quantities of smelting coals have been shipped from South Wales?—Very large quantities.

1454. Can you tell at all what proportion of those coals has caught fire?—I could not say from memory.

1455. But nothing like the whole?—Nothing like the whole.

1456. It is hardly correct to say that all smelting coals must necessarily catch fire, is it?—I qualified my answer by saying that I believe that all smelting coal that contained a large quantity of iron pyrites and which was shipped during wet weather would inevitably take fire.

1457. Are you aware that some of the smelting coals shipped from South Wales have never taken fire?—Yes; the "Usk" on a former occasion loaded a precisely similar cargo, and after being out 154 days she arrived safely at her destination.

1458. What coal was that?—It was shipped by the same firm.

1459. The Messrs. Bath purchase coal from many different people, do they not?—Yes; I do not know what the coal was. I know they shipped both cargoes.

1460. The origin of the two coals might not have been the same?—No.

1461. Are you aware that there are different kinds of smelting coal shipped at Swansea?—Yes.

1462. And some of those have never been known to take fire?—I know that several ships loaded with smelting coal from Swansea have never taken fire.

1463. You are not able to state what coals shipped at Swansea are liable to take fire, and what are not?—I could not specify them.

1464. What would be the cost of shipping coals in barrels?—As a shipowner, I have not gone into that question, but I would be glad to take a cargo of coals for 2*s.* 6*d.* more per ton, I finding the barrels.

1465. Are you aware what the value of barrels is?—I do not know what they would be in large quantities. I should think empty flour barrels, or old hogsheads or sugar hogsheads, would be the proper things to use for the purpose.

1466. A sugar hogshead is worth, I think, 5*s.* or 6*s.* What quantity of coal would a sugar hogshead carry, probably about 7 cwt. or 7½ cwt?—I am not able to say how much it would carry. It would add materially to the cost if that is the case. I do not think the old barrels would cost as much as 5*s.*; a trade would spring up in them no doubt. If you want hogsheads for a certain purpose, you have to pay more for them than if you took thousands of them every year.

1467. Are there many old barrels to be got at the shipping ports?—I should say there is an immence number at Liverpool.

1468. How would you get them from Liverpool to Newport?—I would bring them down.

1469. That would cost a great deal?—I have not gone into the cost. I am only saying what I am firmly convinced would be a sure preventative against spontaneous combustion. I think it would be much cheaper on the whole than the scheme recommended by the chemist, who propose to introduce iron pipes through the ship's hold, and pass carbonic acid through them. I think it would be a difficult matter to make carbonic acid in a gale of wind at sea. I believe if the coals were stowed in old bags even, it would prevent spontaneous combustion, so long as they were not stuck down close together; so long as there are insterstices between the bags it would be a preventative, but storing the coal in bags would not be so good a plan as stowing it in old casks.

1470. Do you think that it would be possible to get the number of old casks requisite, even supposing the expense were not too great?—Yes.

1471. The casks would have to be brought from other ports?—They might make them at the ports where the coal was shipped.

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1472. A new hogshead would be a very expensive thing?—It depends upon what kind of hogshead you have.

1473. At all events you have not gone into the question of the cost?—No.

1474. You know no doubt the system adopted of shipping coal in the new Alexandra Docks at Newport; I believe under that system the coal has a short distance to fall?—It all depends on the depth of the ship's hold.

1475. Do you know whether provision is made for avoiding the fall from the ship's deck to the keelson?—I have not seen it in operation in the new dock. I have not seen them shipping coal since the docks have been opened. In the old dock we generally adopted the plan of lowering 50 or 100 tons in baskets to break the fall of the others.

1476. The old system of shipping coals was lowering a certain quantity in baskets, in order to break the fall of the others?—Yes, and they adopt that plan now in soft coals—they lower them through the hold.

1477. Can they ship a considerable quantity by baskets in a day?—Yes, but it is more expensive.

1478. What quantity can you ship in a day by baskets?—About 400 or 500 tons.

1479. Is it quite practicable to fill the hatchway up to a certain height by baskets and then to commence with the ordinary coal drop?—Yes, that is done generally with deep ships where there is a heavy fall; they lower a certain quantity down by baskets. I think, with regard to the royal mail steamers, they made it a contract in their charter that the coal should be so lowered.

1480. You cannot state what coal it was that caught fire in the two cases you gave, namely, the "Herbert Graham" and "Minnie Graham"?—In the case of both the "Herbert Graham" and the "Minnie Graham," three or four different sorts of coal went to make up the cargoes; they did not buy all the coal from the same man.

1481. Can you state what the different sorts of coal were?—I think it is stated in the evidence; it says in the case of the "Herbert Graham" that the stiffening was all brush coal, which came principally from the Mamhole Colliery; then there was small coal from Coalbrook Vale, and some from Cwm Serchen, and there was large coal from the Cwm Colliery at Aberbeeg; there were four different sorts of coal.

1482. And in the "Minnie Graham?"—In the "Minnie Graham" there were 60 tons 3 cwts. of Hope large coal, 20 tons 6 cwt. of Hope brush—I am not acquainted with these coals—and 323 tons of Tyrfilkin brush coal, so that there were four sorts of coal in the one and three in the other.

1483. (*Mr. Fenwick.*) Did you say that you paid 10 guineas per cent. insurance upon a vessel from the north to Coquimbo?—Yes, she discharged cargo in Dunkirk, and I sent to the agents in London to ask what they would get her insured for for the voyage, out and home, and the agents said I would have to pay the same as before, but when I came to settle it I had to pay 10 guineas on the balance of about 1,800*l.* on the voyage out only.

1484. What premium do you pay in loading small coal from Swansea?—I have not had many ships loading at Swansea, but I had an iron ship loaded with a cargo of iron in Newport in August last. She was launched at Stockton, and she came from Stockton to Newport with a half cargo of pig iron, and then she loaded a cargo of railway iron at Newport and a insured her for the voyage out to Talcahuano, and to come back to the United kingdom with nitrate at 100*s.* per cent.

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1485. (*Mr. Icely.*) What description of coal is used for smelting purposes?—Bituminous coal—the small house coal.

1486. Is it the custom to screen it?—No.

1487. Is it what is called through and through coal?—It is not so large as through and through is as it comes from the pit. This coal would be coal out of which the large had been picked.

1488. It is all slack coal?—It was pretty nearly all slack coal that was shipped in those vessels.

1489. (*Mr. Abel.*) What is your reason for supposing that danger arises from the coal getting wet?—When coals get wet they get caked together, and becomes very hard, and a mass like that in the centre of the ship is a source of danger. It is the same with everything that is packed when wet; as it appears to me, it gets very hot after a time—a haystack will do so, or powder if stacked wet in the centre of a barrel, will generally get warm.

1490. You consider that coal containing iron pyrites, if it does not get wet, will not be liable to spontaneous combustion?—I do not think there is anything like the danger.

1491. You described the precautions that you would take to guard against explosions. Do you know any instance of explosion having occurred on a coal laden ship?—I have known several in Cardiff, but I have not inquired into the particulars. The mate of one ship, after the ship had been loaded, took a lighted candle into the hold and an explosion occurred. I do not know the particulars. The ship had been loaded four or six hours.

1492. Do you know the nature of the damage done by the explosion?—Part of the poop was blown away in that particular ship.

1493. Do you know of any instance in which fire followed the explosion?—No.

1494. (*Dr. Percy.*) I think you began by stating that personally you have no faith in ventilation?—Not for those smelting coals.

1495. Having stated that, you afterwards recommended a particular system of ventilation, did you not?—No; I stated the system I adopted, and I think in ships which I loaded at Liverpool, we were obliged to adopt that plan by the Board of Trade.

1496. You spoke of there being a great quantity of iron pyrites in smelting coal. How does the iron pyrites occur in smelting coal; is it in lumps or small particles?—In small particles.

1497. Did you see it distinctly?—We saw it in those samples before the court.

1498. Large heavy lumps of iron pyrites weighing half a pound?—No, it was distributed in the coal itself.

1499. Was any careful examination made to ascertain the quantity of iron pyrites?—Yes.

1500. You laid great stress on the importance of shipping this smelting coal dry. Have you known any cases of ships laden with smelting coal, shipped dry, taking fire afterwards?—I do not know of any.

1501. Do you know whether in those cases that have come under your own observation in which smelting coals had taken fire, the coals had been shipped when wet?—In all the cases it had been shipped wet.

1502. In all the cases of spontaneous combustion with which you are acquainted the coal had been shipped wet?—Yes; that is three.

1503. Do you know whether the same kind of smelting coal has sometimes fired and sometimes not fired?—I can only speak to the fact of my own ship being loaded by the same charterer in Swansea, the one time with wet coal and the other time with dry coal, and the time when she was shipped with wet coal she took fire.

The witness withdrew.

MR. JOHN BLADON examined.

Mr. J. Bladon.

1504. (*Chairman.*) What is your business?—That of a coal shipper at Newport.

1505. Have you been in that business for many years?—More than 25 years.

1506. Do you ship both large and small coal?—Yes, principally large coal.

1507. Will you tell us how coal is shipped generally at Newport?—It is shipped by means of a shoot

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which receives it from the truck and carries it to the hold of the vessel into which it falls.

1508. Are large and small coals both shipped in the same way?—Precisely in the same way.

1509. Is the fall considerable from the end of the shoot to the bottom of the ship?—No, the shoot generally rests upon the edge of the hatchway; the fall depends upon the size of the ship; in small coasters you would not have a fall of more than 6 or 8 feet; in a large ship the fall would be greater, it would be from 8 to 18 or 20 feet.

1510. Various kinds of coal are shipped at Newport?—Yes.

1511. Will you describe them?—There are two special descriptions, one is called the steam coal, which is used for marine and locomotive purposes, and the other is called house coal. The two coals are essentially different in their nature; the steam coal is a coal that is considered to be free from sulphur and tolerably pure, and is therefore not much subject to spontaneous ignition. The house coal on the contrary is a coal which contains a large proportion of sulphur. It is also of a softer nature than the steam coal, and it contains a larger proportiou of iron pyrites, and we consider it much more subject to ignition spontaneously, than the steam coal.

1512. Do you include under the general term of "house coal" smelting and smithy coal?—Perhaps it might comprise both coals, but we ship very little coal for smelting purposes at Newport; it is shipped principally, I believe, at Swansea.

1513. What classes of ships are generally employed to carry those different descriptions of coal?—The large steam coal which is generally screened at the colliery and then taken down to Newport and re-screened there for the purpose of taking out the small coal that may have been produced by the journey you ship in the vessels of almost all classes. Coasting ships such as go to ports on the English coast where a large quantity of steam coal often is sent, would vary from 100 or 150 tons to 300 tons; vessels going to and from foreign ports will vary between 300 tons, or less probably, and a couple of thousand tons.

1514. With regard to the house coals, where do they come from principally?—They come from the same district as the other coal, but they are generally found in the upper series; the coals nearest to the surface are house coals generally.

1515. What are their names?—One coal is well known under the name of Mynyddyslwyn, another house coal well known in the district is called the Cwmtilery and there are some other coals that go by other general names, but the two I have mentioned are the principal ones.

1516. Will you describe the ships that are generally used to carry those coals?—The ships usually employed to carry those coals are principally for the coast, say from 100 to 300 tons burthen; occasionally they are sent foreign, but not often.

1517. As you have little or no smelting coal shipped at Newport, the amount of house coal or even steam coal shipped for long distances is small with you?—Comparatively small as regards house coal, but the reverse as regards steam coal.

1518. You said that you considered the steam coal much less liable to spontaneous combustion than the house coal?—Yes, and for this reason, the steam coals contain much less sulphur than the others, and of the two they are harder and also purer. The house coals contain apparently as you look at them a considerable portion of sulphur; the sulphate of lime, as it is generally termed, is apparent upon the pieces as you see them in the truck.

1519. What is the colour of sulphate of lime?—Yellow. Sometimes it has a silvery appearance.

1520. Do you mean there is sulphate of lime as well as sulphate of iron?—Yes.

1521. You say that the cargoes of steam coal vary very much, some being as low as 300 tons. Which do you consider most subject to spontaneous combustion the larger or the smaller quantities?—The larger the quantity of coal you have in the mass the more subject it is to spontaneous combustion. But I have never heard of any cargoes of large well shipped steam coal ever taking fire.

1522. Do you then attribute spontaneous combustion to moisture principally?—I do.

1523. It is in your opinion most important that the coal should be shipped dry?—Yes, with the view of avoiding spontaneous combustion.

1524. Have there been numerous cases, so far as you know of combustion, from the coal having been shipped in a damp state?—I have not heard of many such cases. I remember within the last year or two hearing of the spontaneous combustion of some cargoes of coal that had been shipped at Newport, those coals were red ash house coal, not white ash, or steam coal. The coal was a kind called brush or small coal. When the coal is taken out of the mine and brought out to the surface, the large nobs are put into the truck and sent down to Newport and shipped, and the inferior coal is thrown aside and dealt with either in the character of brush coal or small coal.

1525. You are now speaking of house coal?—Yes.

1526. House coal in your opinion is liable to combustion, and it is a danger to be guarded against if it is shipped damp?—Yes.

1527. Is it possible to prevent its being shipped damp?—It would be possible if you had no regard to the expense, but when the coal is brought to bank, and the large coal is taken away, the small coal is generally cast aside and put into a heap and left there till required for sale, when it is sent to Newport. It generally gets pretty damp as it lies on the ground, and when it comes to Newport we can never say that it is in a perfectly dry state.

1528. Have you studied at all the question of ventilation?—Not a great deal. There are very few ships that we load at Newport which are ventilated. I have known cases in which large American ships have been loaded with large coal, when great care has been taken in the ventilation, but as as a rule the ships are not ventilated at all that are loaded at Newport.

1529. Do you consider that ventilation tends to prevent spontaneous combustion?—I should say it would. When you get a large heap of heated small coal at the colliery you find the heat is not on the surface, but in the centre of the mass.

1530. Do you think that by passing a continuous current of air through it spontaneous combustion would be checked or promoted?—That, perhaps, might depend on the fact whether it was shipped damp or not. If it were shipped damp of course the ventilation would scarcely affect the condition of it so much afterwards. If it were shipped dry I should say ventilation would have a tendency to prevent spontaneous combustion.

1531. If the coal were shipped damp you would be rather afraid that ventilation would be likely to promote the fire, whereas if the coal were shipped dry you would encourage ventilation?—Yes, I think I should.

1532. Does spontaneous combustion often take place at the pit?—Not often; occasionally it does. When you stack small coal in very large quantities combustion at the pit's mouth is not at all an uncommon occurrence.

1533. Have you known many instances of spontaneous combustion of coal which has been stacked after purchase?—Small coal is never stacked before shipment by purchasers. A few years since, the Royal Mail Company used to purchase large coal screened and fit for use from the Risca collieries, and store it to the extent of several thousands of tons, 5,000 I believe, at Newport. The heap, as near as my recollection will enable me to judge, would be from 7 to 10 feet high, and I never heard of its taking fire, or being considered liable to spontaneous combustion at all. But instances of purchasers storing any coal at the colliery or elsewhere prior to shipment are rare.

1534. You do not know of many instances of coal

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taking fire spontaneously when in store or when stacked ?—I cannot speak to any such cases as having actually seen them myself.

1535. (*Mr. Vivian.*) Have you shipped any coal which has taken fire ?—I think not.

1536. (*Mr. Abel.*) Can you give any specific instances of spontaneous heating or actual taking fire of heaps of small coal ?—I am agent of the Ebbw Vale Company who possess many large collieries. The managers of those collieries have assured me that they had known not actual fires but heat to be generated in a heap of small coals which they prevented from actual firing by throwing the coal over a larger space.

1537. In all those cases the coal had become wet ?—Yes.

1538. Was it pyritical coal ? Was it house coal or steam coal ?—Steam coal. But all steam coals contain more or less pyrites as well as house coal but not to anything like the same extent.

1539. Did this heating in the heap of coal occur at any particular period of the year ?—I cannot say at what period it occurred. I think it occurred during the warm months, because the action of the sun and the wet upon the coals would be much more effective during the warm weather than in the cold weather.

1540. A large quantity of small coal is shipped, is not there ?—Yes.

1541. You do not remember any specific instances of fires with coal of that kind on board ship ?—No. We have sent and shipped from various works more than 200,000 tons in the course of a year.

1542. Are they all short voyages on which these ships sail ?—No, most of them go tolerably long voyages, the principal part of the coal being steam coal.

1543. Do some go to South America ?—Yes, and some to the West Indies and some to the East Indies.

1544. (*Dr. Percy.*) You said that some of the Ebbw vale coal when stacked in heaps was liable to take fire or to become hot ?—

1545. From what particular seams would that coal come ?—It would be small coal thrown together in a heap without regard to the particular seams from which it came.

1546. You cannot state whether the coal from one particular measure or seam is more likely to ignite spontaneously than the coal from another ?—I could not do that.

1547. As to patent fuel, have you known of a case of spontaneous combustion from patent fuel ?—I have not heard of any.

1548. (*Chairman.*) Is there any patent fuel shipped at Newport ?—No.

1549. (*Mr. Ferguson.*) Could you tell the depths of the heaps and the stacks which you say became heated or took fire ; is there any limit of depth at which combustion or heating would be preventible ?—I cannot give the depth at which heating would be likely to occur. I have seen heaps of coal 30 or 40 feet high.

1550. You said that large quantities were more likely to take fire than small quantities ?—Yes.

1551. But there is no limit of height at which you would draw the line ?—No, small quantities of small coal thrown together, say to a height of 6 or 8 feet, would not be liable to spontaneous combustion probably.

1552. (*Mr. Duncan.*) Did I rightly understand you to say that the 200,000 tons which you said you had shipped in the year were small coal ?—No, it was principally large.

1553. What proportion of it might be steam coal ?—I should say nineteen-twentieths.

1554. Properly screened steam coal ?—Yes.

1555. So that in speaking of the number of tons of coal that have gone in the year without accident, you were speaking principally of steam coal ?—Yes.

1556. And not of these house coals or the small slack which you think would take fire more readily ?—No ; in former days we shipped from a place called Abercarn considerable quantities of coals which contain this objectionable iron pyrites, but the shipment of them has been given up for several years that in giving a description of the two sorts I bear in mind what our workings were many years ago.

1557. I gather from what you say, that a shipper, like yourself, and those working the coals, are perfectly cognizant of the coals likely to generate spontaneous combustion ?—Yes, I think if you put the question to any shipper of coal, he would be able to tell you whether they were liable, more or less, to spontaneous combustion.

1558. They judge by their own observation ?—Yes, they judge from past experience.

1559. Seeing that we have had such a great number of cases of combustion on board ship lately, that is to say, in the years 1873 and 1874 as compared with what we had formerly, do you think it is likely that that increase may have arisen from the fact that when coals were very dear, a considerable quantity of those coals which used not to be shipped were put on board ship ?—I think not. I think that the shipment of small coals at Newport in large quantities is rather a new trade. I think that formerly the small coal shipped at Newport was generally considered smiths' coal and it was generally sent to the various ports round the coast, but the shipment of small coal for foreign districts is somewhat of a new trade. At Newport I know that I purchased for a London firm a cargo of 1,000 or 1,200 tons of this red ash, small, or brush coal, but that was an exception to our general trade. We are not in the habit of sending cargoes of small coal from Newport in ships of anything like that size.

1560. Taking you away from Newport, would it be a fair inference to draw, seeing that, as you have stated, coal shippers know that a particular kind of coal is likely to ignite and ought, therefore, not to be shipped for long voyages, that if there was a great pressure for steam coals, and high prices were being paid for them, it is possible that men may have been tempted to send away coals which they would not have sent away in former years ?—I hardly could go so far as to impute such an action to any of the coal shippers, there is no doubt that many fresh coals have come into the market within the last few years, but coal shippers have a pretty good knowledge of what they ship, they know pretty well whether the coals would be likely to take fire or not on the voyage.

1561. From your own knowledge you are not able to say whether it is possible that the cargoes were mixed sometimes when they were pressed for cargoes, that is to say, that steam coals were perhaps mixed with house coals which would not have been sent except under such pressure ?—I cannot say.

1562. (*Dr. Percy.*) I think you said that the Abercarn coals were likely to take fire ?—The steam coal I should say was not liable at all to take fire but the house coal which we formerly used to ship from Abercarn was liable to take fire.

1563. What was the name of the seam ?—We used to call it No. 1. We had another name for it in Welsh.

1564. You say that the shippers of coals generally know what kinds of coal are liable to spontaneous combustion ?—Yes.

1565. Can you state what kinds of coal in South Wales are particularly liable to ignition ?—I could scarcely do that. Reputation does give an evil name to many coals that are found in the neighbourhood of Swansea ; the intermediate coals lying between Swansea and Newport are generally supposed not to be so subject to spontaneous combustion as those at the far end, but I am not able to give you the names of the coals nor could I give you a general classification of them.

1566. Can you tell us how we can get the names of these coals ?—No ; the only suggestion I could make on that score would be to inquire from the inspectors of coal employed under the Admiralty. If they could not give it you I do not know anybody who could.

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Mr. J. Bladon.

22 June 1875.

1567. (*Mr. Vivian.*) Whence do you derive the unfavourable reports with respect to certain coals which you have mentioned?—You hear them occasionally.

1568. From whom have you heard them?—From people generally.

1569. Is there not considerable competition between the Welsh ports, between Newport and Swansea for instance?—Yes.

1570. That is a point you would be jealous upon. is it not, that is to say, house coals shipped from the neighbourhood of Swansea?—I spoke without any reference to the question of jealousy; everybody would as a matter of course ship as well as they could.

1571. Do you remember a deputation of Newport house coal owners coming down to Swansea to beg that the competition might be lessened?—I do not.

1572. (*Mr. Duncan.*) In your experience are the coals shipped now in as short a time after they are raised from the bowels of the earth as they were formerly?—There is no difference whatever in that respect.

1573. They are not brought to bank and laid out on the hill and exposed to the weather, and then shipped some time afterwards?—In a case of necessity where you have no sale for your coals of course you put them on bank, but as a rule the coals are taken direct from the pit's mouth to the ship, and in the case of house coals more particularly, you would even stop your work for the time being and not raise the coal unless you had the opportunity of shipping it at once, for if it were deposited on the bank it would deteriorate in quality. The worker of the coal, as a rule, gets rid of his large coal as soon as it is landed, by putting it in the trucks, and sending it away.

1574. Practically your experience is that they are sent away and shipped just as rapidly after being raised at the present time as they were 10 or 15 years ago?—Just as rapidly.

1575. (*Chairman.*) The suggestion that the coal being shipped in haste is the cause of the greater number of casualties from combustion or explosion which have occurred of late years has no foundation in your mind?—None whatever.

1576. (*Mr. Abel.*) In what way does the coal deteriorate in quality by being kept?—All coal, more or less, suffers by exposure to the sun and air.

1577. In what way?—The softer kinds of coal perceptibly becomes softer; it becomes disintegrated, and so much has that evil been felt that in most contracts made between the coalowners and the large steamship companies, they stipulate that they shall have fresh wrought coal.

1578. The general effect is a breaking up of the coal; that is the principal deterioration?—Yes, I think so; for instance, if you put a quantity of coal on the ground, and it contains a certain per-centage of small, when you come to take it up you will find that the small coal has increased more *pro rata* than it ought to have done.

1579. Can you call to mind a shipment of any coal that has become small by exposure?—I cannot. As a rule we are not shippers of small coal.

The witness withdrew.

Adjourned to Tuesday next at 12 o'clock.

Tuesday, 29th June 1875.

PRESENT:

THE RIGHT HONORABLE HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

HENRY HUSSEY VIVIAN, Esq., M.P.
FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
JOHN PERCY, Esq., M.D., F.R.S.
J. M. CARMICHAEL, Esq., Secretary.

Captain GEORGE STEINSON examined.

Captain G. Steinson.

29 June 1875.

1580. (*Chairman.*) You are coal inspector for the Peninsular and Oriental Company at Newcastle?—I am.

1581. For how long a time have you acted in that capacity?—Over 14 years.

1582. You also act for some of the public Departments in the same capacity, I believe?—Yes, for the Admiralty, for the India Council, for the Crown Colonies, and in 1864, 1865, and 1866, I inspected for the Egyptian Government but not since then.

1583. Do you inspect the whole of the coal shipped on the Tyne for those Departments?—Yes, on the Tyne and the Wear, and at Seaham as well.

1584. Can you give the Commission any statistics as to the number of ships that have been loaded under your inspection?—I have loaded for the Peninsular and Oriental Company 1,147 ships, for the Egyptian Government, 95, for the Admiralty, 96,for the India Council and for various private parties 170, making altogether 1,508 ships.

1585. What was about the average tonnage of coal carried in each ship?—The average tonnage 1861 was 770 tons; in 1862, 867; in 1863, 706; in 1864, 960; in 1865, 841; in 1866, 841; in 1867, 864; in 1868, 776; in 1869, 780; in 1870, 919; in 1871, 1,093½. I have not the average for the other years, but, I suppose, it would be from 1,000 to 1,100 tons. As regards the ships for the Egyptian Government, the average would be about 500 tons, and in the case of the general ships it would be 600 tons.

1586. That is the average amount of coal carried in each ship under your inspection?—Yes.

1587. I observe that the average has increased pretty steadily?—The average has increased pretty steadily, but I think it has increased more lately on account of so many steamers being loaded with coal.

1588. All those are ships carrying coal foreign?—They are all carrying coal foreign, to Malta, Alexandria, Aden, Bombay, Galle, one or two to Calcutta, Singapore, Hong-Kong, and Yokohama.

1589. Those are for the Peninsular and Oriental?—Yes.

1590. For the Admiralty, where would the coal be going?—For the Admiralty, it would be principally going to the dockyards; some would be going foreign.

1591. The coal for the Egyptian Government would be foreign, and the coal for the India Council would also be foreign?—Yes.

1592. Have you had any cases of ships being burnt at sea from spontaneous combustion?—I may first mention the case of one ship burnt in 1863; that was a very peculiar case. She was fitted with a ventilating shaft, not for coal, but for rice. The owner fixed a fan to keep a current of air over the rice at sea so as to keep the rice cool. That ship was burnt within 60 miles of Galle. I took notice of that casualty, and I made inquiry about it, and I found that the ship took out a cargo of coals from Newcastle, and she got aground somewhere on this coast, and the cargo was landed and was on shore a fortnight or three weeks, and I found that nearly all that time it rained, and the cargo was like muck when it was again put on board the ship.

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1593. Do you knew what the tonnage of that cargo was?—I do not.

1594. What was the name of that vessel?—The "Eliza Rulcke"; she was on a voyage from Newcastle to Galle.

1595. In that case the coal was landed, where?—Somewhere on this coast. I am only giving these particulars from second-hand information. I asked the captain about it, and the captain said that was the case. I know the cargo was put on shore, and I know it was very wet when it was again put on board.

1596. Was it your opinion that this fan contributed to the danger?—No, not at all. That was in 1863. Then I know of no other casualty having occurred in any vessels that I have had to do with till 1872 when the "Bernice" was burnt.

1597. What where the particulars of that case?—She loaded with 1,869 tons of Davison's West Hartley, in 1872. She was burnt very near Bombay. She was a very large wooden ship, and a very fine ship, but I have not any particulars about her ventilation. We did not think anything about ventilation or anything of the sort then.

1598. No particular precautions were taken as regards ventilation in her case?—She was ventilated. All Liverpool ships must be ventilated.

1599. How?—By shafts up and down each hatchway and fore and aft shafts alongside the keelson in the way Mr. Duncan's ships are ventilated.

1600. Have you any particulars with regard to the sort of weather it was when she was loaded?—

1601. Do you remember how the coal was put on board?—The coal was loaded into the ships by a lowering apparatus which we then used, but in loading Davison's West Hartley, they generally have to ship very quickly. There is not much accommodation for loading, and they have to ram the coal in as hard as they can.

1602. Would the coal fall any distance in loading?—It was loaded with a box at the end of the spout.

1603. The bottom of the box would open?—Yes.

1604. So that there would be no great fall for the coal?—There would be no great fall, but we could not often use that apparatus in the hatches.

1605. To what do you attribute that casualty?—I do not know how to account for it. There are many ways of accounting for it. It may have been from pyrites, or it may have been accidental.

1606. Was the coal double screened?—No; none of the coal is double screened.

1607. What sort of inspection would there be with a view to prevent the introduction of coal which was full of pyrites?—In those days they worked night and day, and even if I had been there at night, I could not have seen whether pieces of coal went in full of pyrites.

1608. So that coal containing pyrites might have passed, which in the daytime you would have rejected?—It might pass even in the daytime when I could not see it, because it goes so quickly over the spout.

1609. Are there no precautions taken at the pit's mouth to prevent coal containing much iron pyrites being shipped?—Yes, it is all screened there, but there may be big lumps of coal containing pyrites, the existence of which may not be discovered until the lumps are broken.

1610. You can assign no special cause for that casualty?—No.

1611. What was the next case?—The next was the "Oneiza."

1612. In what year?—December 1872. She was merely missing.

1613. Then the next?—The "Shalimar," she was a very fine new ship.

1614. In what year was that?—In 1873. She loaded 1,942 tons of steam coal, 100 tons of coke, and 148 tons of wall bottle nuts. She was never heard of. She was ventilated in the old-fashioned way with a large platform over the keel. She was rather crank, and her cargo was rather high on account of the platform. She was chock full.

1615. What was the next case?—The "Moorsfoot," an iron ship. She loaded in November 1873, with 1,664 tons of Howard's West Hartley.

1616. Was she burnt?—Yes, I have not the particulars of the case. I merely know that she was burnt. I saw the particulars in the paper.

1617. All you know of that case is that it was a cargo of Howard's West Hartley coal. Do you know anything about the particular pit or the particular seam it was from?—It is all from the same seam. They do not work a great deal of coal.

1618. All the coal of that name is practically the same coal?—Practically the same coal.

1619. Of the circumstances of that loss, you know nothing?—I know nothing of the circumstances.

1620. How was the ship loaded?—She was loaded by the apparatus. The lowering apparatus was used at that time, but the men did not handle it so well as they did formerly. They were beginning to be masters then. They have almost got to be masters now altogether. In that shipment the coal was very much broken.

1621. You think at that time the coal was not handled so well and so carefully as it used to be?—I think so.

1622. What was the next case?—The "Euxine." She was an old Peninsular and Oriental paddle-steamer turned into a sailing ship. She loaded in June 1864, with 2062 tons of Howard's West Hartley.

1623. Precisely the same coal?—Yes.

1624. Was she loaded in the same way?—Partly, not altogether; she was very high, and we had great difficulty in getting the cargo into the ship at all. The coal got very much broken in going in.

1625. It had to fall from a great height?—Yes, she was a very deep ship.

1626. Whose ship was she?—She belonged to somebody in Liverpool; I do not know the owner's name.

1627. Have you any further particulars about that case?—There was one thing that struck me about her; the captain had a quantity of ale on board as a speculation and this ale was stowed on the top of the coal. We know that sailors like ale, and some of them might have been at the ale, and in doing so might have set the ship on fire in the same way as, no doubt, the "Cospatrick" was burnt.

1628. Beyond that you know nothing of the particulars of that case?—No.

1629. What was the next?—The "Oliver Cromwell," a North-American built ship, and then there was the "Calcutta," both belonging to the same owner and both loaded about the same time; in fact, the "Euxine," the "Calcutta," the "Oliver Cromwell," and another ship called the "Cora," were all loaded together.

1630. With what coal?—The same coal, Howard's West Hartley.

1631. From the same pit and the same seam?—From the same pit and the same seam.

1632. What information have you about those vessels?—The "Oliver Cromwell" was ventilated. The captain came and asked me how I wanted the coal ventilated, and I said, "I do not want the coal ventilated at all, it is no business of mine." On that he said he was obliged to ventilate by the charterparty. I said, "Then ventilate according to the "charterparty but, as far as my own opinion goes, I "would not ventilate at all." He further said, "The owners say she must be ventilated." "Then," I said, "ventilate according to the owners' instructions." So he did ventilate according to the owners' instructions, with shafts up and down each hatchway, connected with fore and aft shafts. The "Oliver Cromwell," the "Calcutta," and the "Euxine," were all ventilated, but the "Cora" was not ventilated.

1633. Were all those vessels lost?—The three that were ventilated were lost, that is to say, the "Oliver Cromwell," the "Calcutta," and the "Euxine;" the "Cora" which was not ventilated was not lost. The

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Captain G. Steinson.

29 June 1875.

captain said he did not want any through system of ventilation, and I gave him my ideas of ventilation and he said those were his own ideas about it, that is to say, plenty of ventilation through the deck, plenty of ventilation on the surface of the coal, but no ventilation right through it.

1634. Do you attribute the loss of the other three ships to the fact of their being unnecessarily ventilated?—I do; the "Cora" was loaded along with those other three with the same coal, sometimes one ship was taking in coal and sometimes the other; they got identically the same coal.

1635. Nothing happened to the "Cora?"—No; in the case of the "Cora," when she was shipping her cargo there was a heavy thunderstorm, and the rain came down in torrents and she got a wet cargo. The other ships had dry cargoes.

1636. Nevertheless, the three ships which had dry cargoes and which were ventilated, were lost, whereas the "Cora" was saved?—Yes; the captain was a shrewd American, and he and I put our heads together, and after having a conversation about it he decided not to ventilate her at all.

1637. What other cases have you?—The next ship was the "Broughty Castle;" she is missing; she was an iron ship belonging to Dundee.

1638. Where was she loaded?—She was loaded in the Tyne in December 1873 with West Hartley main; she was a splendid iron ship.

1639. Nothing has been heard of her?—No.

1640. Was her coal wet when it was put on board?—I would not be quite sure. She was loaded at Christmas time; she was not loaded with the lowering apparatus.

1641. Was she loaded from the tips?—Yes.

1642. Was the coal from any particular seam?—It was splendid coal, West Hartley Main, the Low main coal.

1643. What is the next case?—The "Ontario." I believe she took fire; she was not burnt altogether; she was loaded in August last year.

1644. For what port was she bound?—Bombay, she was carrying out coals for the Peninsular and Oriental Steamship Company; she took fire in Bombay harbour, or somewhere near the harbour.

1645. Have you any other case?—The "Poco hontas" which was loaded for the Indian Council in June 1874.

1646. She was loaded with what coal?—Hastings Hartley, 1,580 tons. She was an American wooden vessel.

1647. Can you give us any particulars about her loading? was she loaded from the tip?—Yes, she was not loaded with the lowering apparatus, she was loaded by another plan which we sometimes adopt. We lay a flat platform upon the lower beams, and then the coal lies upon this platform and falls easily down to the hold; there is very little fall by adopting that plan. We make the fall as little as possible.

1648. What happened to that ship?—She was burnt at sea.

1649. Was she ventilated?—She was ventilated with shafts up and down. I cannot say whether fore and aft. I have a suspicion about the cause of that casualty from what I saw myself when the ship was loading. The captain was always going about with a pipe and lighting it with matches and throwing them down, and I said to him, Do not you think that that is rather dangerous?

1650. What is the next case?—Then there was the "Sidra," a steamer, she is missing, she was bound for the Mediterranean, and she carried 1,850 tons of Carr's Hartley. There is nothing to lead to the conclusion that she was burnt. I fancy she has gone down.

1651. Do you know whether she was fitted with water ballast?—Yes, I believe she had water ballast.

1652. You have no reason to think she was lost by fire?—No.

1653. She is a missing coal ship?—Yes.

1654. Will you mention any other case that you are acquainted with?—The "Indian Empire" one of Mr. Duncan's ships, she loaded a cargo of Howard's West Hartley, in 1873. I have not the particulars of whether that case, so as to be able to say she was burnt altogether or not.

1655. How many of the cases you have given us were missing, and how many were burnt at sea?—There were seven ships burnt at sea, and including the "Ontario" there were eight. Those are ships that are said to have been burnt at sea, that is all I know about them.

1656. You cannot state positively that those seven were cases of spontaneous combustion?—They call them cases of spontaneous combustion. They were burnt at sea, that is all I know about them.

1657. Summing up the number of cases you have given us there are eight cases of coal ships burnt at sea, or in harbour, after arrival, four cases of missing ships, including the steamer?—Yes.

1658. Then you have known a few more cases of accidental fire which were clearly not cases of spontaneous combustion?—Yes, three cases in the Northumberland Dock, one ship took fire in the sail room, that was the "Ettrick Dale," and she was very nearly burnt in the dock when she was under the spout. Another vessel took fire at night from some cause or another, the deck was burnt, and some of the burning timbers fell down and fired the coal. Another vessel took fire when the boys were taking in stores after she was loaded, and no doubt they caused the fire.

1659. Those three cases are altogether outside those you have stated before?—Yes.

1660. In none of those cases was the fire spontaneous?—No.

1661. Those eight cases of ships certainly burnt, and four cases of missing ships are out of how many altogether?—Out of 1,510 ships.

1662. Since what time?—Since 1861. In fact those have all been since 1872 except one case.

1663. Since 1872 you have had seven cases of ships lost by fire at sea, or in Bombay harbour, and three cases of ships lost at sea, cause unknown, but which may have been from fire?—Yes, the "Oneiza," the "Shalimar," and the "Broughty Castle."

1664. That is out of how many that you have superintended the loading of since 1872?—215.

1665. So that between 1861 and 1872 you had one, only one decided case of a ship lost by fire out of about 1,300 ships, whereas since 1872 you have had seven cases, and three possible cases out of 215?—That is so.

1666. That indicates therefore a very grave increase in the number of casualties from fire during the last two or three years?—Yes, but I do not believe they were all owing to spontaneous combustion. For instance, in the case of the "Calcutta" the other day, I looked over a list of the crew and there were not two of one nation, they were all mixed up together; I should draw from that the inference that there would be constant rows on board the ship; that they would be always quarrelling.

1667. And you think the ship may have been fired?—I think it not at all impossible that the ship may have been fired. I happened to see a list of the crew and I at once formed that opinion from looking at the list.

1668. You spoke of the charterparties in certain cases requiring ventilation, and you told us that you said to a captain if you are bound to ventilate, ventilate accordingly, but in a case where it was not stipulated that the ship should be ventilated, you talked the matter over with the captain, who was an American, and he arranged that the ship should be ventilated upon your principle, and you told us that in that case no casualty occurred. Will you be kind enough first of all to explain to the Commission whether in those cases where ventilation was required it was required by the Peninsular and Oriental Company or whether it was a matter of stipulation between the owners and the charterers?—The charterparty says that the ship is to be ventilated.

1669. Would the Peninsular and Oriental Company

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be a party to the charterparty?—The Peninsular and Oriental Company would be indirectly a party to the charterparty, but the chartering brokers make the charterparty. I do not know whether the Peninsular and Oriental Company insist upon ventilation or not.

1670. Do the Peninsular and Oriental Company charter ships directly, or do they arrange with intervening people who charter from the owners?—The ships are chartered through intervening people.

1671. So that the Peninsular and Oriental Company themselves do not require any conditions as to the ventilation?—I do not know whether they insist upon such conditions being put into the charter.

1672. At any rate you as representing them on the spot know nothing about any conditions as to ventilation?—No, I have no intructions about it.

1673. What is your opinion about the ventilation of ships carrying north country coal?—The other day a very large iron ship loaded with coal, and the owners were very anxious about ventilation, and they asked me about it. The ship belonged to Messrs. Hall Brothers, of Newcastle. I said that I had no intructions about ventilation. I said, "It does not seem to be decided "yet whether ventilation has a good or a bad effect, "but my own opinion is that it has a bad effect, "but I have nothing to say about the matter." Mr. Hall said, "I wish you would write to the Peninsular "and Oriental Company about it." So I wrote to the Peninsular and Oriental Company about it and said that the owners were very anxious to know what was to be done about the ventilation. They wrote back to say, "We leave it to yourself and the owners to make "the best arrangement you can." I went and saw Mr. Hall and he said, "What do you propose?" I told him what I would do would be this, I would have no through ventilation at all, but I would have a small shaft in each hatchway to let the thermometer down, so that the captain should not be surprised by flames coming up the main-hatch. He said he was not a practical man, but what I suggested was what he thought a very proper thing, the ship was newly-built and it has great square ventilators, three or four feet square, and ventilators fore and aft alongside the keelson full of holes. So the owners cut off all this ventilation, blocked up all the holes, stopped the connexion with fore and aft, and merely put small pipes down for the lowering the thermometers, and she took in 2,478 tons and arrived at Hong Kong all right.

1674. That opinion which you gave to Mr. Hall expressed your judgment that north country coal had better not be ventilated?—That is my opinion, that it had better not be ventilated.

1675. All you require is to take the hatches off?—I would have ventilation through the deck, as much open space through the deck as possible.

1676. To carry the gases off?—Yes.

1677. So far as regards ventilating the interior of the coal, you think it mischievous rather than otherwise?—It would not do the coal any harm if there were no pyrites in it, but if there is any pyrites present, it is almost sure to take fire, if the air gets at it.

1678. You would endeavour to keep the air from the interior of the coal, and only keep the exterior clear of gas?—Yes; I would ventilate the upper surface of the coal, no gas goes below, it all rises.

1679. Do you know anything of South Wales coal?—No. There is one case I forgot to mention. A foreign ship was missing some years ago, which was loaded partly with steam coal and partly with gas coal. I had to do with part of her loading. That gas coal was put in very wet. That was some years ago.

1680. You had not the entire responsibility of inspecting that?—No, I had nothing to do with the gas coal. She was so badly contrived that I would not let any more steam coal go into the after part of the ship, and so they filled her up with gas coal.

1681. As to the methods of loading, you have described the method of lowering adopted by you in the case of shipments for the Peninsular and Oriental Company, do you approve of that mode of loading?—I like it very much, but the men will not work it.

1682. Not at all?—No.

1683. How long is it since they have refused to work it?—This last two years.

1684. Is the coal now entirely loaded from tips?—No, I have a better plan than that, which I mentioned, by which you can do without the men at all. You lay a large platform of wood on the lower beams, and then the coal falls there first and forms a cone in the hatchway, then the coal slips off that cone, and then it has only the depth of the lower hold to fall. I have loaded a large ship in that way. It is better than the other way, and you do not have to depend on the men.

1685. Is that the way in which you are now loading all coal?—Yes, we try to save breakage as much as we can.

1686. When did you begin to load in that mode?—Partly ever since I have been on the Tyne, when we could not adopt the other plan.

1687. What is the greatest fall where you adopt that mode of loading?—It depends on the depth of the ship. We had a ship the other day which had a 20-feet fall after the coal reached this platform. Her depth of hold was about 28 feet; she was a very large ship.

1688. When you say the men will not work the other mode of loading, what do you mean?—The men are masters now and they decline to do it.

1689. Why?—Because it is so much trouble.

1690. (*Mr. Duncan.*) What kind of coal was loaded on board that ship of Messrs. Hall?—Partly Bower's West Hartley and partly Bebside.

1691. That ship arrived at her destination quite safely?—Yes.

1692. And she had no ventilation whatever?—No; only pipes through each hatchway, by which to let down the thermometer. There were ventilators fore and aft alongside the keelson, but Mr. Hall had them all blocked up, and the connexion with the upright ventilators was all cut away, so that they were not ventilators at all. He blocked up the bottom of them.

1693. You had two or three large ships of mine last year?—Yes.

1694. They were ventilated, were they not?—They were ventilated.

1695. And they arrived safely at their destination?—Yes; it does not follow because they arrived safely that it was due to their ventilation. There may not have been any brassy coals in their cargoes.

1696. Is it your judgment that I was not wise in having the ships ventilated?—Some of your ships have taken fire.

1697. And those were ventilated?—Perhaps not, but ships that have been ventilated have taken fire. I argued the point with Mr. Stewart about ventilation, but he persisted in having the ships ventilated.

1698. Though you thought they would be better without it?—Yes. It is a curious thing that none of the north country ships that I have had to do with that have not been ventilated have been burnt. I was talking to an old captain, who told me that he had never had a casualty happen to a ship except in one case, and that was the only time he ever ventilated the ship, and he said he would not go to sea in a ventilated ship.

1699. Your opinion is that ventilation does harm rather than good?—Yes, with north country coal; you cannot have coal very well without pyrites in it; if you could get coal without pyrites in it you might ventilate as much as you liked.

1700. (*Mr. Ferguson.*) In the case of the American ship which went out safe, did I rightly understand you to say that the coal was wet when it was loaded?—Yes.

1701. So that though the coal was wet, and though the ship was not ventilated, the ship arrived safely at her destination?—Yes, a portion of the cargo was very wet.

1702. In the case of the other three ships that were

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Captain G. Stainson.
29 June 1875.

ventilated, and which were burnt, was their coal loaded in dry weather or wet?—In dry weather; there may have been just a thunderstorm.

1703. In the case of the ship which you spoke of last, where you advised the captain to do away with the ventilation, was her coal shipped wet or dry?—Dry, I believe.

1704. You say the owners blocked up the ventilators?—They cut off the bottom and filled them up at the bottom so that they did not act any longer as ventilators.

1705. You approve of ventilation from the upper deck upwards?—Yes, above the coals.

1706. (*Mr. Duncan.*) Do you think the coals were as well cleaned during 1873 and 1874, when there were so many cases of burning, as they were formerly?—No, I do not think they were.

1707. You do not think they were so freed from lumps of coal containing appearances of pyrites?—I do not think they were so well cleaned.

1708. Do you think they are as well screened now as they used to be?—The screens are much about the same; the screens are a little narrower.

1709. Do you think that the fact of coals having greatly risen in price would be a considerable inducement to the colliery owner to send coals less carefully screened than formerly?—I do not think that.

1710. You think in the main they pass through the same process as formerly?—Yes, there is one difference which I believe the Mines Regulation Act has had something to do with. Formerly the coals passed over the screens and fell into wagons, and all brasses were picked out before the coal went into the wagon, but if a piece happened to fall into the wagon there was a boy in the wagon to pick out any little bit; perhaps a lump would break and show a brassy appearance, and the boy could pick out the brasses and put them on one side. Now there are no boys there. I think the Mines Regulation Act may have made them afraid to put boys to work at that; at all events the boys are not there now as they used to be, so that if a piece of brassy coal fell into the wagon it would be likely to remain there.

1711. There was such a great demand for coals when the price was so high that there was no difficulty in disposing of almost any coals?—No.

1712. (*Mr. Ferguson.*) Would you dispense with ventilation for all coals, or only for pyritical coal?—I can only give an opinion about north country coals.

1713. (*Dr. Percy.*) I did not quite understand what you said about the rice-laden ship; was she laden partly with coal?—No. She was a rice ship; she brought rice home.

1714. You spoke about a fan in that ship; do you know whether that fan would be effectual in preventing the heating of rice?—It would keep a cool current of air on the top of the rice.

1715. Is rice liable to spontaneous ignition?—It heats very much and spoils.

1716. The cooling of it by a draught of air prevents that?—It is supposed to do so.

1717. Do you know of your own personal knowledge whether it does?—No.

1718. The "Euxine" was a ship that took fire?—Yes.

1719. And the coal which was shipped on board of her was dropped a long way down?—Yes.

1720. There would be a quantity of small coal accumulated about the spot where it fell?—Yes.

1721. Was any examination made with respect to the particular place where the great fall occurred?—I cannot tell you that. Falling a great distance very often exposes brasses which would be covered up otherwise.

1722. In another ship which took fire I understand you to say that the captain was generally to be seen smoking furiously?—He was always trying to smoke, but his pipe never seemed to light.

1723. A fire occurred in that ship?—Yes.

1724. Have you any evidence to show that the fire took place in the coal and not elsewhere?—No, I merely know what I saw in the papers about it.

1725. You say that from 1872 numerous cases of what was supposed to be spontaneous ignition have occurred, has there been any alteration in the mode of loading, or in the ventilation, or in the kind of coals shipped between 1872 and the present time?—There was a little difference in the loading in the case of those ships. An accident happened at the spout where Howard's West Hartley coal were being shipped, and we had to get the coal in anyhow we could for a while on account of that accident. Several ships were on at the time.

1726. Do you think the effect of that probably was to produce more small coal?—Yes, I reported so at the time. The coal appeared to be very much broken.

1727. The kind of coal was the same?—Yes.

1728. You said that between 1861 and 1872 there were very few cases?—Yes.

1729. Is it certain that the same kind of coal was shipped in that former period as in the period when the numerous cases occurred?—It was the same coal exactly.

1730. (*Mr. Abel.*) You ascribe the heating of coal on board ship entirely to the presence of pyrites?—The firing of it; it will heat, but not take fire without pyrites.

1731. Will you tell the Commissioners a little more explicitly on what you base your opinion as to the undesirability of ventilation?—I believe if coal containing pyrites is heated and a great pressure is put upon it, it merely wants fresh air to make it ignite. I submitted that opinion to a chemist at Newcastle, Mr. Glover, and he said it was a great chemical fact. That was my own opinion, and I got it confirmed by him as a chemist.

1732. You do not object to the circulation of cold air over the coal?—No.

1733. Therefore, as far as that goes, you would consider ventilation to be advantageous?—Yes, above the coal to let the gas escape.

1734. Have you ever known a case of explosion on board a coal-laden ship?—Not with our north country coal. There is not sufficient gas in the coal to cause explosion.

1735. (*Mr. Icely.*) Were ships generally ventilated prior to 1872?—Many ships were ventilated, and the ventilators were generally full of coal before the ship was fully loaded. We could not get the ships loaded for the ventilators, though the ventilators were there they were full of coal. That was what first drew my attention to it. They were of no use because they were full of coal, therefore they did not seem to be necessary.

1736. You mentioned that the boys who formerly picked out the pieces of brassy coal no longer do so?—Yes.

1737. At what date was the practice of employing boys to pick out the brassy pieces of coal discontinued?—It has gradually been discontinued since the Mines Regulation Act came into force.

1738. When did the Mines Regulation Act come into force?—Within the last two or three years.

1739. Those accidents have been more rife since the cleaning of the coal has been neglected?—The men have been getting more careless in every way since then; since they got the big wages they have been getting more careless.

1740. Are you of opinion that the coal has been much more carelessly cleaned since 1872 than previously?—I will not say much more carelessly; it is not so carefully cleaned.

1741. Have the places of these boys been filled by anyone else?—There is a screener at each side of the screen; he is supposed to pick out the brasses.

1742. Did the boys supplement those men?—The boys supplemented those men.

1743. Therefore there was a double check, now there is only a single one?—Only a single one. I do not see much more brasses going in than formerly, and

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I have watched the coal sometimes over 12 hours at the end of the spout.

1744. Do you inspect the whole of the cargo?—I see as much as I possibly can. I cannot see the whole of it.

1745. Sometimes you have two or three ships loading at the same time?—Yes, but I have assistants.

1746. You have authority to reject dirty coal?—Yes, and I order it to be taken out of the ship sometimes when it is in.

1747. Is it the custom in ships which you load or inspect the loading of, for the trimmers to fill the coal right up to the square of the hatchway?—Yes.

1748. Is the square of the hatchway filled with small coal or large coal?—The small coal lies in the hatchway, and before we finish we separate the small all round and put a wagon or two of big coal in the hatchway.

1749. The small is not taken out?—No.

1750. Therefore, it in a measure seals the hatchway; it takes the place of the hatch when the hatch is off?—Before the hatchway is filled up they cut through on each side, and we tip a wagon or two in the hatchway at last so as to allow a circulation of air. In the case of a ship loading in Sunderland some years ago there was a lot of small coal being shipped the last thing into the hatchway, and I wanted the trimmers to take the small out of the hatchway, but they would not take it out.

1751. (*Mr. Vivian.*) Have you heard that there is a great difficulty in working the coal clean underground owing to the men declining to obey the orders of the overlooker?—No, I have not heard so.

1752. You said you had not remarked that there were more brasses in the coal now than formerly?—No, I think not.

1753. If that is so, to what do you attribute the increase in the number of cases of spontaneous combustion in coal-laden ships?—The brasses might be there without my seeing them; a big piece of coal will contain a brass inside, and you will not see it till it is broken.

1754. Are you aware that brasses exist chiefly in certain portions of the seam of coal?—They seem to be all over the coal. You cannot see the brass till the piece of coal is broken.

1755. You spoke of the difficulty which you have had with the trimmers. When did that difficulty begin?—There was a strike some years ago; they used to work night and day, and they struck for shorter hours. I think about two or three years ago.

1756. At the time when labour was so scarce?—Yes.

1757. Did they carry their point?—Yes; and instead of working night and day they knocked off at 5 o'clock.

1758. Since that time the moral effect of their having gained their object has made them less amenable to discipline?—They are decent men enough, but they will not work long hours now.

1759. Was the working the long hours the cause of the coal being better put on board ship?—No, the first part of the cargo was generally put in in daylight.

1760. You would not attribute the difference to the cessation from working long hours?—No.

1761. You attribute it to the negligence of the men, and their indisposition to work?—They will not work the lowering apparatus.

1762. Because it gives them trouble?—Yes.

1763. Is not that a question of wages; would not you be able to induce them to work it if you gave them more wages?—They have told me sometimes they would not work it if I gave them the ship and the cargo too.

1764. There is a general indisposition to put themselves to any trouble?—That is it.

1765. That has arisen since the strike, two years ago?—They always objected to work this thing; they used to call it the devil; they consider it is a nasty thing to work.

1766. They used to work it?—Yes.

1767. Since the strike, when they got the better of their masters, they have declined to work that machine?—Yes.

1768. What was the objection they had to this machine?—There is a good deal of care required in handling it; one or two men got their fingers snapped off in working it; they have a good deal of trouble in working it.

1769. Are any more wages paid for working it?—The men were paid 10*s.* a ship-load more, but that was stopped.

1770. Do you think if the men had been properly paid for working it they would have declined to work it?—Yes. I do not think any money would have induced them to work it.

1771. It is dangerous to work it?—There is little danger about it.

1772. Could not that danger be obviated by better mechanical arrangements?—Yes; the thing was never properly fitted.

1773. The fault seems to lie really with the shippers?—The colliery people ought to fit proper things, but they will not take any trouble about it.

1774. You would rather blame the colliery people than the men?—They are both to blame, I think; the men do not like anything that gives them more trouble, and the colliery people do not seem to take much trouble about it.

1775. It is to the advantage of the colliery owner to ship coals in as good a condition as possible, is it not?—They do not seem to think so; they charge the same price for coal whether badly shipped or well shipped.

1776. You give a preference to coal which is well shipped over coal which is badly shipped, do you not?—We want the coal as good as we can get it. I am supposed to look after it, and I do the best I can.

1777. Supposing one colliery shipped coal well, and another colliery shipped coal badly, you would report that to your principals, would you not?—Yes.

1778. Have you done so?—Frequently.

1779. And still it has produced no effect?—Yes, it has produced some effect; we cannot always get the coal we want; we must take the coals we can get.

1780. At present there being no such great demand, you can pick and choose?—What I mean is this, supposing we have got a ship to load with coal, and we have only got so many days to load her in, and suppose we cannot get the coal we want, we have to get some other coal.

1781. The fault seems to be a very divided one?—Yes, it is.

1782. (*Chairman.*) I suppose when the coal fever has thoroughly subsided, a little more attention is likely to be paid to improvements in modes of loading?—I do not know about that. The fever has subsided in the north now I should think.

1783. Coal owners are still hoping for a rise in price?—The next thing should be a fall I think.

1784. Do not you think if it is found that this method of shipment is really advantageous, and that the men are unwilling to adopt it from the danger arising from it, that some exertion will be made to improve it?—For my own part, I prefer this new plan to which I have referred, when I can get plenty of planks with which to make a platform.

1785. Is that plan adopted by anyone but yourself?—No, I do not think any one takes any trouble about the matter except myself.

1786. The Peninsular and Oriental Company stand alone in trying to ensure as far as possible the proper shipment of coal?—There is no one else that I see taking any trouble about it.

1787. Do your instructions from your principles at all point to the desirability of so shipping coals as to avoid the danger of spontaneous combustion?—There is nothing about spontaneous combustion in my instructions.

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Captain G. Steinson.

29 June 1875.

1788. It is not a danger to which your attention has been called?—No, I have had very little instructions about it.

1789. Your instructions are to see that good coal is shipped rather than to consider what may happen during its transportation?—I never heard anything about spontaneous combustion till lately when these ships took fire, and then they wrote to me to give them my opinion upon the matter, and I wrote to them upon the subject.

1790. They being now in possession of your opinion upon the subject, they have not issued any particular instructions?—No.

1791. You were commander of a ship yourself, I think?—Yes.

1792. Did you ever command a ship laden with coals?—When I first joined the company, I took a ship up the Red Sea, and I happened to fall in with the log the other day in which I kept a record of the temperature as shown by the thermometer in the cabin, in the fore-hold, and in the aft-hold.

1793. When you commanded a coal-laden ship, you were very careful to observe the temperature every day?—Yes, every day.

1794. Is it the custom now in coal-laden ships to observe the temperature from day to day?—No, I spoke to some captains of ships about carrying a thermometer with them, and they said it would be a very expensive thing, but a thermometer only costs a couple of shillings, and they also said it would be an expensive thing to put down a tube, but that would not cost much.

1795. Did you record the temperature in the log?—Yes, I find in this log which I kept I have got the latitude and longitude, the course of the wind, the state of the weather, and the state of the temperature according to the thermometer in the cabin, in the fore-hold, and in the after-hold.

1796. Would you think it desirable in coal-laden ships that a note should be made in the log daily of the temperature of the coal?—Yes, I think so.

1797. And that that should be required by law?—I think so. When I wrote to the company, and said I had induced the owners instead of having ventilators to put down a thermometer, they said, in reply, that they quite approved of it, and they would like if I could induce the owners of all the ships to do the same thing.

1798. (*Mr. Abel.*) You carefully noted the temperature at different times?—I marked it every day at noon.

1799. What would you have considered an indication of danger in connexion with those observations of the temperature?—If the temperature was gradually rising, I should think the coal was heating.

1800. What steps were you prepared to take in the event of there being indications of danger?—I should let in water, or do something of that sort.

1801. You had no definite measures laid down beforehand that you would have taken?—A sailor is always prepared for difficulties; if he is not, he is not fit to be a sailor.

1802. You could not tell the precise nature of the means you would have adopted?—I was never beaten yet.

1803. (*Mr. Fenwick.*) It is chiefly or entirely Hartley coals that you have inspected?—Yes; I have shipped other coal for the dockyards, that is only for short distances.

1804. Speaking of Hartley coals, they are all from the same seam, are they not?—No; there is the Low Main coal and the Yard seam.

1805. Is there any marked difference between those two seams?—A considerable difference. Before they come to work the Yard seam the Low Main is generally pretty well worked out; the coal is crushed out, you can tell the difference because there is a great deal of pillar coal in it.

1806. Is one seam more liable than another to contain pyrites?—I could not say that.

The witness withdrew.

Mr. J. Glover.

MR. JOHN GLOVER examined.

1807. (*Chairman.*) You are a chemical manufacturer at Newcastle?—Yes.

1808. And a member of the Chamber of Commerce of Newcastle?—Yes.

1809. You have given your attention to the subject which this Commission was appointed to inquire into?—I have.

1810. Will you tell us what led you to turn your attention to the subject, and what opportunities you have had for forming an opinion upon it?—My attention was more particularly directed to it from reading the lamentable accounts that appeared in the newspapers from time to time of the serious loss both of life and property from such occurrences, but my attention had been previously directed to the question as a chemical manufacturer storing large quantities of coal. I conversed with several of my friends upon the matter from time to time and from the chemical education I had received I formed certain opinions. Those were deemed to be sufficiently cogent to lead the Northern Maritime Insurance Association of Newcastle to write to me asking my opinion as to the causes of fire in coal ships, and they forwarded to me from time to time certain protests which they received from captains giving their accounts of fires, and I wrote certain letters on the subject. Our local authorities asked me if I had any objection to my letters being sent either to the Shipping Gazette or to the Liverpool Insurance offices. I said, on the contrary, I was anxious that they should be made use of in any way that was desired. The result was my being requested to attend this Commission.

1811. Will you tell the Commission what the nature of that correspondence was?—The Secretary of the Maritime Insurance Association asked my opinion of the effect of ventilation on coal-laden ships, and, after due consideration, I came to the conclusion that ventilation ought rather to be avoided than sought for. I then suggested to them that if they could cover the surface of the coal with small coal and hammer it down as close as possible so as to keep the air from the cargo, it would be an advantage instead of putting in trunks to carry air into the centre of the cargo. I may mention that ventilation would, in my opinion, be advantageous if it could be applied to the whole bulk of the cargo, that is to say, if it could stream up through the coal as water would stream through a filter; but that desirable state of things cannot be practically arrived at. Therefore, instead of taking the air into the coal I would endeavour to keep it out, because, granted that spontaneous combustion was imminent in the cargo, an abundant supply of air would tend to fan the flame.

1812. You are speaking of north country coal?—I am speaking of north country coal. That is the only coal I have had experience with.

1813. You have not studied the question in connexion with Welsh steam coal?—Not at all.

1814. It is only with reference to north country coal that you are giving your evidence?—Yes.

1815. What do you consider to be the cause of spontaneous combustion in north country coal?—In my opinion the principal cause of combustion is the presence of bisulphide of iron in the form of coal brasses with a little moisture in the coal. Dr. Percy in one of the tables in his recent work on fuel, draws attention to the fact of a coal containing a much larger amount of sulphur than another not being so spontaneously ignitable as that other coal. If I had had time I would have produced specimens to the Commission showing that brasses (or pyrites) exists in coal in two or three distinct forms. It exists in the massive

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form, and it exists also in the form of very fine filaments, almost microscopically fine, those filaments being combined with filaments of equally finely-divided coaly matter. We have a condition in that latter case which we have not in the former, and though there might be more sulphur in the former case than in the latter the coal in the latter case would be more liable to ignite spontaneously on account of the finely-divided structure of the coal and the brasses. Dr. Percy also mentions in his valuable work on fuel, that coal very finely divided will spontaneously ignite. There is little doubt that it will, if you have the necessary condition of quantity of that finely-divided coal. I can scarcely imagine that there could be that condition of quantity of finely-divided coal in a coal cargo. Those are two conditions; and then there is another condition: all our coal contains a quantity of shale, and that shale contains a quantity of a very volatile and highly bituminous substance; it may be in the form of paraffin or some of the compounds that yield paraffin. I have obtained from shale from 12 to 15 parts of volatile matter of a highly inflammable character. By the table in Dr. Percy's book it appears that the most highly inflammable coal is schistose coal, that is, coal containing schist, and I would throw out a suggestion to the Commission that probably the quantity of schist in coal may have a great deal to do do with spontaneous combustion. Certainly the bisulphide of iron has to do with it, of that there can be no question, and as regards the second condition, when a gentleman like Dr. Percy is satisfied with the result of the experiments of continental chemists which went to show that finely divided coal would also spontaneously ignite I think we may accept it as a fact.

1816. You divide the conditions of spontaneous ignition of coal into three classes?—Yes.

1817. What remedy would you propose to apply?—Speaking of spontaneous combustion, and not of explosion, the remedy I would propose would be, in the first place, that there should be inserted into the coal, through the deck, if possible, a number of ¾-inch iron gas pipes placed 8 or 9 feet apart, down which gas pipes should be lowered at fixed intervals a self-registering thermometer. Every day the captain should enter in his log the temperature of each of those pipes, and if he found the temperature rising in any of them, he should be prepared with an apparatus of which I submit a drawing to the Commission (*handing it in*): an apparatus consisting of a wooden cistern with a false bottom, into which you would put chalk, and upon that you would pour hydrochloric acid. I have made some calculations with the detail of which I need not trouble you, but I find that taking, what is called in our district round coal, that is to say, the best coal, a ton of coal when packed in a ship leaves about 12½ cubic feet of interstitial space; that interstitial space is all that we require to be filled with carbonic acid gas, carbonic acid gas being antagonistic to combustion. Given, 1,000 tons of coal in a ship, we would then have 12,500 cubic feet of interstitial space to fill with gas, and to fill that interstitial space with carbonic acid gas would require 36 cwt. of chalk and 80 cwt. of hydrochloric acid, therefore, for 1,000 tons you may say the expense would be about 80 cwt. of hydrochloric acid, which costs, exclusive of carboys, about 2*l.* per ton, the chalk being merely nominal. The size of the cistern which would be required would be about 12 feet long, 6 feet wide, and 6 feet deep. Probably an objection might be raised to having to provide a cistern of that size, but it might be used in the passage out as a store for fresh water. If even the chalk was placed in it, the chalk would do the water no harm, but the chalk might be kept outside. The expense of the apparatus would be merely nominal. The temperature at which coal might ignite is an important question. I see Professor Graham in his report on the firing of the "Amazon," goes into that question, and he shows that coal may ignite at very low temperatures; but the conditions that Professor Graham refers to would not be present, such as laying the coal upon hot spaces. We don't expect that the coal would be laid upon hot spaces, except it might be in a steam ship.

1818. You have explained to us the precautions you would take in the case of actual combustion. Have you any recommendations to make to the Commission with regard to what should be done to prevent the spontaneous combustion of coal either in respect to the loading of the coal, or in any other respect?—I know of no means that would prevent the firing of the coal taking coal as it is ordinarily shipped on board ships. I think the firing of the coal is only a question of time.

1819. You mean there is no one method of loading better than another?—I know of no one mode of loading better than another. The coal is usually lowered down, and the interstitial space is a matter of accident. When I gave you 12½ cubic feet in a ton, I took that from an average of 27 different kinds of coal.

1820. You do not consider that the coal falling any distance, and breaking and becoming smaller adds to the danger of spontaneous combustion?—If we take the observations of Dr. Percy as regards small and finely-divided coal, of course if you increase the quantity of that finely-divided coal by a greater fall, you increase the danger from that source.

1821. Do I gather from what you have said, that you think the less amount of air which has access to the interior of the coal the better?—That is my meaning, taking other things into account.

1822. So that in the ordinary sense of the word the ventilation of north country coal is prejudicial?—Decidedly. I have come to that conclusion.

1823. Your recommendation, therefore, would be to do absolutely without internal ventilation, and to take that precaution which you have described to us in the event of heating?—Yes, that the captain should always have the means of knowing whether his coal was heating. Given the application of carbonic acid, if it was not applied till the coal was in active combustion it might be prejudicial rather than beneficial. If there was any mass of coal in active combustion it would decompose the carbonic acid and become carbonic oxide, and so tend to feed the fire.

1824. In all cases you say the spontaneous ignition of the coal is only a question of time. Are not some denominations of coal much more liable to combustion than others?—I cannot speak from absolute observation. I should say there would be. I know when I want coal brasses I go to different collieries to get them. I go to a particular colliery if I want a hard and massive coal brass, if I wish to burn it to get the sulphur out; and I know that in other collieries the bisulpide is so finely divided, and the coal is so finely divided, that it is of very little use for my purpose, and the coal of those collieries in which it is in that finely-divided state would be more likely to take fire.

1825. You consider that some coal is much more likely to take fire on board ships than others?—As a matter of opinion, I do not speak from experience. I have told you on what I base my opinion.

1826. You are not prepared to mention any facts tending to show the unfitness of certain classes of coal to be shipped long voyages?—No. I may mention that I have had put into my hand a great number of returns from the Board of Trade, on looking through which it appeared to me that it would be very useful if, on the captain applying to the consul for the usual protest in any case of loss or damage to the ship or cargo by the spontaneous combustion of coal, certain questions were put to him. The questions which I would suggest should be put to him are as follows: 1. Name of ship? 2. When, where, and of what build; also class, sailing, or steam? 3. Was vessel tight when loaded? 4. Was vessel tight when in a gale or straining? 5. How often did you pump bilge, and what quantity each time 6. Was bilge water warm, hot, or cold? Colliery coals came from; and was it round, unscreened, or small? 8. Was cargo put on board dry, damp, or wet? 9. Was cargo ever wetted from the deck or bilge? 10. Date when loaded and where? 11. Date when first satisfied cargo was on

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fire, and what latitude and longitude? 12. In what part of ship did fire commence? 13. Was cargo ventilated, and if so, state method employed? 14. Weight of cargo?

1827. (*Mr. Abel.*) In referring to the influence of pyrites in bringing about spontaneous heating of coal, you spoke mainly with reference to the state of division of the pyrites; do you consider that the state of division is the only reason why pyrites in some instances favours spontaneous heating of coal more than in others?—I do come to that conclusion most decidedly. I find that a mass of pyrites, free from admixture with coaly matter, is not liable to ignition; for instance, we bring large quantities of pure pyrites to this country without the admixture of coaly matter, but we never have such a thing as spontaneous combustion in them. I keep perhaps many hundreds of tons in our works for 12 months, and find no appearance of combustion, that is in pure bisulphide of iron, but I cannot keep coals for half or perhaps a fourth of that time without their igniting spontaneously; they may ignite spontaneously without any appearance of heating on the outside. I have found when I have got to the bottom of the gears, (which are the woodwork supporting the platform on which the waggons run bringing the coal to our works,) that the gears are burnt through.

1828. Are there some kinds of pyrites that are more liable to change than others, not speaking exclusively of pyrites which exists in coal?—I think some change more than others, but not in the direction of spontaneous combustion.

1829. In what way do you consider the hydrocarbons which you spoke of as having found in schistose coal contribute to the spontaneous heating of coal?—Granted a slight heating in the coal and an evolution of that highly volatile gas, I think it quite possible that that gas might ignite; some of these gases ignite at very low temperatures, much below that necessary to ignite coal. It is just possible that that gas might be given out by the gentle heat that is evolved from coal.

1830. You think it would ignite at a lower temperature than sulphur would ignite at?—Considerably. The flashing point as defined by the Act of Parliament of many of the hydro-carbon oils is from 120° to 150°.

1831. That is the temperature at which the vapour is given off but not the temperature at which the vapour ignites?—No.

1832. Whatever the temperature at which the vapour is given off all those hydro-carbons ignite at very high temperatures, do they not?—I am not aware of that.

1833. And sulphur at a comparatively low temperature?—About 230°. Its melting point is about 230, and it spontaneously ignites at 300 or thereabouts.

1834. You do not consider that the hydro-carbons in any way directly contribute to spontaneous heating, do you?—It is a theory I throw out mainly based on what I observe in Dr. Percy's table with regard to the non-inflammability of some coal bearing a relation to the schistose quality of the coal. And from having experimented on the schist of the coal measures and finding a quantity of light hydro-carbon vapour, given off, it struck me that there might be some connection between the two which this Commission might work out.

1835. Is not the schistose coal a more porous coal than the compact coal?—The schist is a very compact substance, like slate; it is called slate in our neighbourhood.

1836. You do not consider that it is more porous than compact coal, that is to say, than ordinary pit coal?—Not more porous, I should say, it was less porous. You can split it up into thin laminæ.

1837. Would not that indicate that it would be more permeable by gas or air?—The laminæ are perfectly invisible; with a sharp instrument you can strike the schist in such a manner that you can separate it into aminæ.

1838. As it separates into laminæ or very thin layers the structure must be comparatively speaking open?—Not so loose as coal; you can break coal into thin layers.

1839. You do not consider that this schist would be more liable to absorb oxygen or other gases than hard coal?—I could not answer the question without experiment.

1840. You consider that the state of division of the coal is of considerable importance as affecting the question of spontaneous combustion?—I do consider so.

1841. Have you any personal experience which you can give as a reason for considering that the state of division of the coal must exercise a considerable prejudicial influence?—I know that all carbonaceous matter when in a state of fine division is subject to spontaneous ignition, and coal would be no exception, and especially gas coal, but it must be in a large mass; you must have a considerable mass before you can have either from brasses or from finely-divided carbon such an evolution of heat as would lead to combustion.

1842. You have no special views or facts to give us with regard to the influence of a fine state of division of the coal?—No, my views are somewhat vague upon the question of the effect of that state of fine division of the coal.

1843. In speaking of applying carbonic acid for the purpose of extinguishing fire in a cargo of coal, you spoke of the inadvisability of applying it when the fire had reached some considerable dimensions or any dimensions at all?—Yes.

1844. Why would it be inadvisable to apply it under those circumstances?—When you have coal in active combustion, that is when the heat is high, that is a condition in which the carbonic acid may be decomposed.

1845. The fire must have reached to a considerable degree of intensity to produce that result?—Yes, but it might be localised, and then it would reach a state of considerable intensity. It would scarcely have reached that intensity without having manifested its presence even if there were none of those tubes which I recommend, but with the tubes I think it could not possibly have reached that state of intensity, therefore I would have the tubes as an essential part of the apparatus.

1846. You consider your method of applying carbonic acid would be applicable provided proper temperature observations were made?—Quite so.

1847. (*Dr. Percy.*) Have you any personal experience of the spontaneous ignition of coal in a mass?—As a manufacturer I have. I have had many such cases.

1848. Did you observe the conditions under which that ignition took place?—The condition that would be necessary to satisfy you I think was not observed; the only fact that I did observe was that when the coal was worked out and the men had taken it away in their barrows I saw that the gears were burnt through. What was the condition of the coal in contact with the gears at the moment they were bared, I do not know.

1849. You had not an opportunity of inspecting the phenomena that occurred in those cases?—No.

1850. Your conclusions are based upon chemical knowledge, and not on individual personal experience?—Based on my chemical knowledge, but in our chemical works we do sometimes use large quantities of brasses; we have them laid down in a mass, and we know from experience that we cannot have them lying there a month without great risk of the whole mass firing. We have to use them up as fast as we get them.

1851. You are speaking of pyrites from coal measures?—Yes.

1852. If I understand you correctly there are no precautions requisite to be taken with regard to the other kind of pyrites?—Not the slightest. After 30 years' experience with pure pyrites from all parts of the world I may say that I never knew a case of spontaneous ignition in any of the pyrites properly so called.

1853. You have not known any case of spontaneous

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ignition of pyrites unless intermingled with carbonaceous matter ?—Not unless intermingled with carbonaceous matter.

1854. In your opinion that is the condition of this ignition ?—That is the condition of spontaneous ignition. With bi-sulphide of iron alone, so far as my experience goes, there is no danger, but where you have bi-sulphide in combination with carbonaceous matter, then there is danger.

1855. With regard to this schist, the schist weathers pretty rapidly when exposed, does it not ?—Some of the schists do.

1856. Do not most of them, those, for instance, that are raised out of the collieries, and which you see in mounds at the top of the pit's mouth, do not those weather and split up rapidly when exposed ?—I have often gone round a colliery mound to examine the heaps, and I have not observed that they are weathered in all cases.

1857. Have not you seen some rapidly fall to pieces ?—Yes. I have seen some rapidly fall to pieces.

1858. Have you made any experiments with regard to the quantity of pyrites in those schists ?—No, I have not.

1859. You do not know whether it would be present in any sensible amount ?—No.

1860. The schist to which you refer contains coaly matter ?—Yes.

1861. Have you seen heaps of this schist on fire ?—Yes, I have frequently seen them on fire; it burns from quite black to white, which is a proof that it is coaly matter, I think, and not bisulphate of iron.

1862. As to gas coal, in your term "gas coal" would you include good cannel coal ?—Yes.

1863. Do you think that that is likely to ignite spontaneously ?—I think finely-divided portions of cannel coal would be very likely to ignite spontaneously.

1864. Is that simply a chemical opinion you have formed, or is it the result of personal experience ?—Entirely a chemical opinion. We do not use cannel coal in the north to any extent.

1865. With regard to your proposal to use hydrochloric acid to generate carbonic acid, how would you recommend that acid to be kept on board ship safely ?—I know of no other method but the ordinary method of keeping it in carboys.

1866. If they were to break it would be rather awkward, would it not ?—Yes, but it is not a very corrosive acid.

1867. Still it would be unpleasant ?—Yes.

1868. With regard to spontaneous ignition of finely-divided coal have you any personal experience upon that subject ?—No, I have not. How far the tendency to spontaneous ignition is due to the finely-divided state of the coal, or how far it is due to the presence of brasses, I have no means of knowing.

1869. (*Mr. Ferguson.*) Do you consider that coals shipped wet are more liable to spontaneous ignition than coals shipped dry ?—Decidedly; moisture is one of the main conditions tending to the firing of coal.

1870. If coal were shipped dry there would be less danger of ignition ?—If coal were shipped dry there would be less danger of ignition. That reminds me of a suggestion I was going to make, that perhaps it might be possible in case of coal being shipped wet to inject through the coal a current of hot air by the tubes I have mentioned. It would not cost much to do that.

1871. If coal were shipped dry there would be less danger, you think ?—If shipped dry and kept dry there would be very little danger, and therefore I would suggest that it is very important that the surface of the coal be ventilated, and the shafts for ventilation should be carried well up he mast, so that in shipping a sea it should not go into the coal.

1872. There is a danger in ordinary ventilators of water getting down the ventilators ?—Yes.

1873. You do not approve of the ventilators being carried through the coals ?—Not through the coals, but it is imperative that the surface should be ventilated, there should be a wooden trunk carried up the mast, so high that in shipping a sea there would be no danger of its going into the cargo.

1874. (*Mr. Duncan.*) You have stated that you think the coals being shipped wet is a great predisposing cause of their taking fire spontaneously, what inference would you draw from this fact, that it appears from the ascertained statistics that the cargoes of the greater part of the large number of ships that sailed in 1873 and 1874 were shipped in the driest months of the year ?—I am not prepared to draw any inference at all from that fact. I would first require to know all the particulars in such cases; though the cargoes were shipped in the driest months of the year, it does not follow that they were shipped dry. I would require to know whether there were thunderstorms at the time, and whether the bilge water was allowed to come in contact with the lower part of the coal, and whether the ship in straining made water. All those facts would have to be ascertained before I could give an answer.

1875. Are you so confirmed in your opinion that water is the cause of spontaneous combustion that you would still hold to that opinion, notwithstanding such cases were brought to your notice as we have had brought before us in evidence to-day, by Mr. Steinson, who told us that three cargoes were shipped in perfectly dry weather, and that the ships were well ventilated, notwithstanding which the ships were burnt, whereas in a fourth case, where the cargo was shipped very wet, and where the ship was not ventilated, it went perfectly safe ?—As I said before, if any inference is to be drawn from the dryness of the coal, or as to the effect of moisture in producing spontaneous combustion, you require to know all the facts; for instance, you would require to know not only whether the three cargoes were shipped dry, but whether they were kept dry.

1876. If you had a pile of coals on your own premises you would roof them over, I presume, in order to keep them dry ?—Yes; the drier coals are kept the less they will deteriorate, and they will not be so liable to take fire, whereas if coals were not covered, they would take fire.

1877. (*Mr. Vivian.*) Do you think that the coal that is wrought and shipped now in the north of England contains more shale than it used to do ?—I cannot say whether it does or not.

1878. Not being interested in shipping coal, you have had no means of observing ?—No.

1879. Do you find that it is more dirty than it used to be ?—I find the small coal decidedly dirtier than it used to be.

1880. What per-centage of ash does your small coal contain ?—The per-centage of ash varies; from the best quality of coal we got 8 to 10 per cent. and I have found in some descriptions as much as 22 and 23 per cent. of ash.

1881. Are you able to state what it used to be in former days ?—In former days, (unless we went to a particular coal, which I need not specify,) the average amount of ash, so far as my recollection goes, would be about 10 or 12 per cent.

1882. 10 or 12 per cent. against what ?—At present from the best that we get it is about 10 per cent. In a great deal that we get from the steam coal field it is about from 18 to 22, and I have known it 23, but that is only in some steam coals. I observed that large per-centage in a description of coal from some collieries which I had not previously gone to, so that it does not follow that the per-centage would be larger in that kind of coal, because I had not an opportunity previously of trying that kind of coal. These per-centages are the result of experiment; we try every cargo of coal that comes into the works for ash.

1883. So that the small of the steam coal in your district contains a large amount of ash as now delivered ?—It contains a large amount of ash as now delivered; what might have been the amount previously I have no means of stating authoritatively.

1884. If as we have heard, shale is spontaneously ignitable, that may to some extent account for the

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increase in the number of cases of spontaneous ignition which have occurred during the past few years? —If a certain amount of shale is present in the coal, and if it is spontaneously ignitable, as I believe it is, the amount of shale would render the cargo more liable to spontaneous ignition, but I may mention that most of the shale comes into the small coal, in fact I should think nearly all the shale comes into the small coal.

1885. In your judgment would coal which contains no sulphur ignite?—It would not ignite from the cause that leads to the fixation of oxygen by sulphur and iron combined with sulphur; but taking Dr. Percy's view of the matter, if it contained very finely-divided smal coal, it would be as liable to ignition if it contained no sul phide, owing to the finely-divided state of the small coal

1886. You said in the early part of your evidence that in order to ignite under those conditions a certain quantity of coal must be heaped together?—Yes.

1887. Can you state what quantity that should be?—I would be a rather bold man to state the quantity, but certainly it would be a very large heap, not less I should say than from 200 to 500 tons.

1888. The depth would have to do with the spontaneous ignitability of such coal?—Yes, certainly.

1889. What would you put as the depth of a heap in which you would say spontaneous combustion would be likely to take place?—If you had a depth of 8 feet to 12 feet, you would have a condition in which the coal would spontaneously ignite. I have certainly seen ordinary small spontaneously ignite under a depth of 15 feet repeatedly.

1890. That was coal that contained pyrites?—Yes, and shales.

1891. I am speaking of coal which contains no pyrites?—I have no experimental proof in that direction; it is all matter of opinion.

1892. You said that coal brasses would ignite, what per-centage of sulphur would those coal brasses contain?—They vary a great deal, they contain from 22 up to 30 per cent. of sulphur.

1893. And the ordinary Spanish pyrites contains what?—From 40 to 50 per cent.

1894. So that the difference between the two is probably made up of carbonaceous matter?—It is made of chiefly carbonaceous matter; almost entirely; you may say entirely carbonaceous matter.

1895. Have you ever received cargoes of small pyrites?—Frequently.

1896. Have you ever known them to heat?—Never we have kept small pyrites in the works for 11 years.

1897. Do you know of any sulphur existing in coal which is not in combination with iron?—I do not know of any, certainly.

1898. If sulphur were found by analysis in coal, you would naturally conclude that it existed in a state of pyrites?—Yes.

1899. Can you imagine any other combination in coal in which sulphur might exist?—I do not know of any, unless it is sulphate of lime.

1900. Sulphate of lime would be wholly undecomposable?—It is quite inert.

1901. What would be the cost of the apparatus you have suggested to the Commission?—I have not gone into the question of the cost, but the whole apparatus would not cost 20*l.*, perhaps 25*l.* would fit up the whole apparatus on board a large ship.

1902. Where would you place the apparatus?—In the most convenient part of the ship; of course in a coal-laden ship the apparatus should be placed on deck.

1903. How would you apply it?—The *modus operandi* would be simply when the thermometeric indication showed an increasing temperature, increasing up to a point which ought to be specified to the captain in charge of the ship.

1904. Interrupting you for a moment, what would that point be?—If I had charge of a ship, and observed the heating going on from the ordinary temperature till it had risen to about 200°, I should then give a dose of carbonic acid, observing still the thermometeric conditions, that dose would be given by pouring in the hydrochloric acid gently down the orifice, so that there should not be too much effervescence; the carbonic acid would find its way to the bottom of the ship, and you could fill the ship full with it, in the same way as you could with water.

1905. Would you connect the pipe leading from the apparatus with the hose?—I would have iron gas pipes laid down into as many compartments as the ship may be divided into, and connect them with a pipe issuing from this apparatus, probably by a coupling or connection of indian rubber pipe; indian rubber pipe would probably be the best, because it would give with the motion of the ship. On pouring in the hydrochloric acid, the gas would be evolved, and it being a very dense gas, it would find its way to the bottom of the ship, filling all the interstices; of course, no human being must be below at the time.

1906. You would pass it down the pipe which showed heat?—No, those pipes would simply act as indicators; but, certainly, if those pipes were perforated at the bottom, you might put it down the pipes themselves.

1907. You would continue to pour in the carbonic acid till the whole of the interstices of the coal were filled up with carbonic acid?—Till the whole of the interstices were filled. As I mentioned, a thousand ton ship would require about 36 cwt. of carbonate of lime or ordinary chalk, and about 80 cwt. of acid of the common strength of the chemical works. You would get it at 2*l.* a ton, then there would be the cost of the carboys, which would be more than the acid, where the contents of the carboy might cost 2*s.*, the carboy itself would cost 3*s.* or 4*s.*

1908. You believe that carbonic acid existing in the condition of dry gas, would be sufficient to arrest the decomposition of the pyrites?—I think it would entirely. I think it would prevent the decomposition of the pyrites, and therefore the evolution of heat. I do not think pyrites would decompose even with moisture in the presence of carbonic acid.

1909. You consider the presence of carbonic acid would arrest the decomposition of the pyrites?—Both arrest decomposition and put out any fire present, provided the fire had not got into a state of violent incandescence.

1910. Fire would hardly exist at the temperature you have given, 200°?—The heating might inadvertently rise to 400° or 500°.

1911. If you poured it on when there was a temperature of 200°, it would be when the decomposition of the pyrites was going on?—Yes.

1912. Would the presence of carbonic acid arrest that decomposition?—I think it would. Experiments would have to be made; it is a thing to ascertain by experiment with a large quantity of coal, whether the decomposition might not go on further, because many a ship has got to its journey's end safely, which if the voyage had been continued a little longer, so that the process of decomposition had gone on a little further, might have been burnt.

1913. Carbonic acid being a very heavy gas, would, I presume, expel the air from the interstices and take its place and remain there permanently?—Yes, unless it was highly heated.

1914. Would there be any danger to the men in discharging that ship?—The ship would have to be carefully attended to if the dosing with carbonic acid had been just before the ship making its port. The presence of carbonic acid could be easily determined by lowering down a light which would be put out at once.

1915. It is conceivable that the carbonic acid might remain occupying the whole of the interstices of the ship till she reached the end of her voyage?—If the ship was heated up to 250°, so that when the carbonic acid got heated up to that heat, it would be apt to be displaced by the surrounding air, it would simply arrest it for a time, but that time might save the ship. If a portion of the coal had really got into a state of slow combustion it would arrest that combustion; but

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as to saying that when once filled with gas it would remain there the whole voyage, I think it would not.

1916. You would not recommend giving the ship a dose of carbonic acid before she started as part of her cargo?—No, I would recommend, if possible, drying the cargo by giving it a dose of warm air. When you give a dose of carbonic acid, you must have no living being below deck.

1917. (*Mr. Duncan.*) That is a practical question that has been occurring to me, because in many ships the crew live forward below the deck, they would have to live on deck during the administration of this carbonic acid?—They would have to choose the least of the two evils and live on deck.

1918. (*Mr. Vivian.*) Or you might have tight bulk heads to keep the gas away from that portion of the ship?—Yes.

1919. (*Mr. Abel.*) With regard to your proposed application of carbonic acid, I believe, however dense a gas is, it has a tendency to diffuse itself into the air, has it not?—Yes.

1920. So, that unless your hold were perfectly gas-tight, the carbonic acid would gradually diffuse itself into the air in other portions of the ship?—Into all the other portions of the ship; but supposing your bulkheads were perfectly tight it could not diffuse itself through an iron bulkhead.

1921. It would be necessary to have gas-tight bulkheads in order to imprison the carbonic acid?—In one particular place.

1922. In order to prevent its finding its way to other portions of the ship?—Suppose you had a ship divided into three bulkheads, you would have three separate pipes proceeding to your carbonic acid apparatus. Suppose the middle compartment was heating, you would connect the middle compartment with the carbonic acid apparatus.

1923. With reference to the sulphur existing in the coal, if you found the proportion of sulphur in a coal to be considerably in excess of that required to combine with the iron which you found, you would come to the conclusion that there must be some sulphur not in combination with iron?—Yes.

1924. Have you not known that to occur in many instances?—No.

1925. Have you not seen some analyses published by Dr. Percy of coals, in which the amount of the sulphur is very much in excess of that required to combine with the iron in order to form pyrites?—I have not read that in Dr. Percy's work.

1926. Have you ever heard of a schistose mineral containing no iron at all, but containing a considerable quantity of sulphur in its composition?—No.

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1927. (*Chairman.*) You said you would require as much as 80 cwt. of muriatic acid to produce enough carbonic acid to permeate the whole mass of a thousand tons, how much does a carboy hold?—A carboy holds about 1 cwt.

1928. So that you would require to carry 80 carboys on deck. You could not put the carboys below?—The carboys could be carried easily on the surface of the coal.

1929. If I am not mistaken acid is obliged to be carried on deck in an ordinary merchant ship?—Yes.

1930. You would make a special exemption in a coal carrying ship, and allow a certain quantity of acid to be stowed below?—Yes; there is no other apparatus that would carry it, unless you fitted up a wooden cistern to hold the muriatic acid, and then it would be difficult to keep it tight, perhaps you could make it perfectly tight by gutta percha.

1931. Otherwise 80 cwt. of muriatic acid on deck would be rather an awkward load, would not it?—Yes.

1932. (*Dr. Percy.*) You would have a wooden case tarred?—Yes, it would last the voyage, probably. My experience of gutta percha is so adverse that I do not recommend it; a stone cistern would hold it; a wooden case tarred would hold it a long time, but the slightest permeation of the acid through the pores of the wood coming in contact with the bolts that bound the cistern together, would eat them away in time. I know that in storing muriatic acid we never use wooden cisterns, we always use stone cisterns.

1933. Have you ever made any experiment with regard to the effect of steam in extinguishing fire?—Never, but I should think it would not put out a fire.

1934. Supposing we had steam at our command, and we blew that steam down on a mass of coal in ignition, what do you think would be the effect?—Whether it would put the fire out or not I would be inclined to doubt along with Professor Graham in his report. Professor Graham seems to think that it would be of little use; the objection I would have to the use of steam would be the quantity you would have to blow in, and the consequent condensation of that quantity, wetting the coal again.

1935. You say you have made a determination of the per-centage of ash in the coal, did you ever make a determination of the quantity of water contained in the coal supplied to you?—Yes; we find taking 19 cargoes out of 20 we got about three per cent. of moisture in the coal.

1936. Quite sufficient moisture, supposing the air gets access to the coal to ignite the pyrites?—I think so; if that three per cent. remained in the coal as water, it would have that effect.

The witness withdrew.

MR. EDMUND SQUIRE ROBERTS examined.

Mr. E. S. Roberts.

1937. (*Chairman.*) You are inspector for the Peninsular and Oriental Company in respect of their coal shipments at Cardiff?—Yes.

1938. How many years have you been in their employ?—Seven years.

1939. Can you give the Commission any idea of the number of the ships, and the tonnage of the cargoes that you have inspected?—We ship about 150,000 tons during the 12 months, and I should think nearly 100 vessels are employed. I did not look at my books, but I think about 100 vessels load during the year.

1940. I may take it roughly that you have inspected 1,000,000 tons of coal and some 700 ships?—Yes.

1941. Have you had more or less during the last few years?—More. I ought to say perhaps in the first year we did not have so much as the quantity I have mentioned. It is lately that we have had more.

1942. Have you had any cases of spontaneous combustion or explosion of coal shipped from South Wales?—I have had only one case of explosion.

1943. And none of spontaneous combustion?—None of spontaneous combustion.

1944. What do you attribute that remarkable immunity to?—That we ship the best steam coal in the district.

1945. And that the best steam coal is not subject to spontaneous combustion?—I think that the best steam coal is not subject to spontaneous combustion.

1946. With regard to ventilation, does the Peninsular and Oriental Company lay down any rules as to ventilation?—No rules whatever.

1947. What do you find as a matter of practice is generally done as regards ventilation?—We find as a rule, they wish to construct large wooden ventilators throughout the ship.

1948. And they do so?—Yes.

1949. You do not charter the ships?—No.

1950. You only contract with the charterers?—Yes.

1951. Therefore you do not interfere?—Not in the least.

1952. What is your opinion with regard to the question of ventilation?—That it is better left alone altogether than done in the way it is generally done.

1953. That is that air should not be allowed to permeate through the coal?—Yes.

1954. All that you require in your judgment is to

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keep the gases from the surface?—I think you require ventilation on the top. I look out for something of that sort. I have no orders to do so; but I impress upon the captains to have the hatches a little free, and to have ventilators at either end of the vessel.

1955. That is in order to carry off the gas and keep a current of cool air on the surface?—Yes.

1956. Beyond that you would not go?—No, I think it prejudicial to the safety of the coal to do anything else.

1957. Why do you think it prejudicial?—I think by having those ventilators in the bottom of the ship and having them up and down the hatchways, you create a draught and you raise the enemy you are trying to keep out.

1958. If the coal gets heated and a draught passes through it, it is more likely to increase the combustion?—I think so.

1959. At any rate from what experience you have had, you think the risk is less in keeping air from the interior of the coal altogether?—Yes, I do; all the ships I have heard of, where they have had, what they call spontaneous combustion, which I do not believe in, have been ventilated.

1960. You say that you do not believe in spontaneous combustion. You have no doubt heard of ships with which you have had nothing to do, in which fires have taken place?—Yes, which have been said to have been caused from spontaneous combustion; but I think, it has been from carelessness. It has no doubt been from explosive gases.

1961. Are you speaking of South Wales coal?—Yes.

1962. You are aware that with regard to the north country coal, there is no question that the coal does take fire?—I understand so; I do not know much about north country coal.

1963. Speaking of South Wales coal, you know of no case well substantiated, of actual spontaneous combustion?—I do not.

1964. Though you do know of cases of explosion?—Yes.

1965. Where gas has collected which has been accidentally lighted?—Yes; by people taking a light, or by some means or other.

1966. Not gas which in itself would be liable to take fire by contact with oxygen?—No, not at all.

1967. Can you tell us anything about your method of shipping coal? does the Peninsular and Oriental Company insist upon shippers shipping in any particular way?—Yes; we are very particular, we make them lower the coal into each hatchway till there is a sufficient quantity raised in each hatchway, so that it should not break.

1968. So that there should never be a heavy fall?—No great fall.

1969. Will you explain the method?—We have a box which we put at the end of the shoot, which box, after it is filled, is lowered down to the bottom of the ship till we get a good pile of coal, then the remainder of the coal is allowed to run on to this pile of coal which has been formed by the box.

1970. You say the box is put at the end of the shoot?—Yes; the coal goes down the shoot; there is an iron tub or box which comes to the mouth of the shoot and is filled; when that box is filled they stop the run of coal in the shoot and then they lower the box down.

1971. And then they raise the same box up again?—They raise the box up; it is a system that requires a great deal of attention.

1972. It also takes a great deal of time?—Yes.

1973. How many tons can be put into the ship in an hour upon that plan?—I am not prepared to answer that.

1974. Can you tell how long it takes to fill up the hatchway?—That would be according to the depth of the hatchway. I should say 10 waggons could be carefully shipped in an hour; but it would be expensive, and would take a long time comparatively, because the same quantity of coal could be tipped in 15 minutes.

1975. Your preference for this method is on account of the avoidance of breakage?—Yes.

1976. You have not in view the consequent risk of combustion?—No; only I consider that it is the small coal that is likely to generate gas.

1977. All that you look to is to see that you get the coal you contract for?—To see that we get large lumps rather than small.

1978. Your instructions from the company do not point to the danger of combustion?—They do not allude to it in any way.

1979. The danger has not been thought of?—It has not been thought of in South Wales at all.

1980. Have you had any experience in respect of the storage of coal in large quantities?—I have.

1981. Where?—In Alexandria.

1982. Where you agent for the company there?—No; I was in charge of a coal depôt. I was their marine superintendent, and I looked after all the cargoes shipped, and I looked after the supplying of the ships with coal. The agent was a gentleman on the shore who looked after the freights.

1983. You transacted their coal business?—Yes, for 12 months.

1984. While you were acting in that capacity had you any large amount of coal stored at any time?—A great quantity.

1985. Did you have any experience of combustion in the case of any of that coal?—Not with our own coal; but during the time I was there I saw other coal ignite belonging to other people, notably the Russian Government. They had a store close to us which ignited.

1986. (*Dr. Percy.*) What coal was it?—I am unable to say.

1987. (*Chairman.*) What was your coal?—Both kinds, north country and South Wales.

1988. Did you mix them?—No; we keep them in separate heaps.

1989. Did you apply any system of ventilation?—Yes, in each stack of coal as we landed it we always ran a tunnel through the coal fore and aft and athwart, and we had a sort of chimney built of the coal in the middle of the stack; that would be in a heap of 1,000 tons, for instance.

1990. What was the object of that ventilation?—To prevent spontaneous combustion.

1991. Did you apply that to both kinds of coal, both bituminous and South Wales?—Yes. The Arabs always understood they had to build this tunnel; that was a part of their contract.

1992. Did you consider that that ventilation was any good?—Yes.

1993. Why should it be of use on shore and not on board ship?—It is perfect on shore. There is air all round, as it were; the mass of coal is not confined in any way. There is a tunnel running in the coal one way, and across it in the other, and you have the air all round it, whereas in a ship you have not got the same conditions; it is confined on all sides.

1994. You do not think ventilation in itself mischievous, but it is mischievous because you cannot make it perfect?—Exactly.

1995. Were your stores covered at any time?—Yes, they were all covered, so that the coal was not exposed to wet.

1996. You had very little rain at Alexandria?—Except at certain seasons in January and December we have a great deal of rain, but all our coal was under cover. I should not like to leave it exposed to the rain.

1997. Was the reason you kept it covered to preserve it from deterioration, or because you thought if you did not keep it covered it would be liable to spontaneous combustion?—To preserve it from deterioration.

1998. You did not think there was any risk of its taking fire from its being uncovered?—No; we considered that the coal being exposed to the atmosphere, and the rain and the sun would disintegrate it, and thereby deteriorate it.

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1999. You would not ventilate the interior of the coal on board ship ; you would keep a current of air on the surface, and you would let the coal fall when it was being loaded as little as you could help ?—Certainly.

2000. Have you any other suggestion to make to the Commission whose object is to see what should be done with reference to spontaneous combustion ?—The only suggestion I could make is, that only the best coals should be sent on long voyages, and not those inferior coals.

2001. When you say "those inferior coals," the Peninsular and Oriental Company buy the best, I presume ?—They try to do so.

2002. Have they occasionally found themselves buying inferior coal ?—They find themselves with inferior coal, though not buying it.

2003. You mean the coal owner does not give them what they expect to get ?—It does not always turn out so.

2004. Do they make their contracts at first hand with the coal owners ?—Direct with the coal owners ; but what I was more particularly referring to, was that there are certain coals from South Wales that it would be dangerous to carry on long voyages.

2005. Why are those coals dangerous ?—Because they contain a great deal of iron pyrites.

2006. In your seven years' experience have you known of any casualties happening in ships carrying that description of coal ?—I have heard of them, but I have not taken any particular notice of them.

2007. You know generally the kinds of coal that are to be avoided ?—Yes.

2008. It is your duty to keep your principals well informed upon that point ?—Yes, that is my principal duty down there to see that they do not get that sort of coal.

2009. The liability to spontaneous combustion is a matter you specially direct your attention to ?—Yes, individually. I have no instructions to do so. I should warn my principals if I knew that coal was being shipped which I thought would be dangerous, but I have no instructions to do so.

2010. What classes of coal do you think ought not to be shipped for long voyages ?—All those that have much iron pyrites in them, and also the coals in which there is a large intermixture of sulphur. No. 2 Rhondda from my district is a very dangerous coal.

2011. Is that an extensive seam ?—Yes, it is very largely worked by nearly every colliery in the Rhondda Valley.

2012. Is there any other that you could put in the same category ?—Some of the Monmouthshire coals I think are very dangerous.

2013. Could you give any general name that would describe them ?—All the coal raised in Monmouthshire, which is not called the Elled vein.

2014. All other Monmouthshire coal you think liable to combustion ?—Yes.

2015. (*Mr. Vivian.*) Would you say that all the Monmoutshire coals except the Elled vein are liable to spontaneous combustion ?—They are more liable to spontaneous combustion than the Elled vein. I should say that all coal from the ironworks collieries of Monmouthshire and Glanmorganshire is very liable to combustion. We have a great deal of iron pyrites in the coal raised from those collieries, and I consider that a very dangerous coal.

2016. Are you acquainted with the Dowlais coal ?—Yes, I have shipped a good deal of it.

2017. That is a first-class steam coal, is it not ?—It is a very good steam coal.

2018. That is an ironworks coal, is it not ?—Yes.

2019. Would not you except that ?—No. I should say that was very liable to combustion.

2020. Dowlais coal is considered at least as good as any steam coal shipped in South Wales, is it not ?—It is a beautiful coal.

2021. It is the highest class steam coal, is it not ?—It is as good as the others.

2022. Do you consider that liable to spontaneous combustion ?—They cannot keep the iron pyrites out of it. I have to see that they do not give us too much of it.

2023. Is not it worked from precisely the same beds as the regular steam coals of South Wales ?—Yes, but it has this pyrites in it which is very difficult to entirely eradicate, and there being a great deal of that amongst the coal, it makes it a dangerous coal ; there is more pyrites in the Dowlais coal than any coal I have to ship.

2024. Have you ever known any instance of Dowlais steam coal igniting spontaneausly ?—Never one.

2025. The Cyfarthfa, Messrs. Crawshaw's, is a first class steam coal, is it not ?—Yes.

2026. Have you ever known a case of that firing ?—I think I have. I have heard of several cases, I think. I have not a very good opinion of that coal.

2027. Fothergills, Aberdare, is a coal which is very largely shipped, is it not ?—Yes, that is a very dangerous coal.

2028. Have you ever heard of an instance of that catching fire ?—No, it is full of iron pyrites.

2029. You have never known an instance of its catching fire ?—No, I have never heard of one. We have never shipped much of it.

2030. That coal is as largely shipped as any coal in South Wales, is it not ?—Yes, the only cargo of that that I had to do with I had to reject in consequence of its being very dirty and unfit for steam purposes. It is full of iron pyrites.

2031. Still you have never known any case of its catching fire ?—No, but I do not look after cases of casualties that occur in any other coal but my own coal.

2031*a*. It is a matter of great importance to you to keep yourself well informed as to what coals do catch fire, is it not ?—No, I cannot say that it is. It is not a matter my employers want to be posted up in at all. Till I had the honour of receiving a communication from you the matter has hardly been under my consideration at all.

2032. What coals have you chiefly shipped ?—The best Aberdare and Merthyr coals, Davis's Merthyr and Ferndale, and we used to ship the best of the Powell Duffryn and Insoll's Merthyr.

2033. Nixon's ?—No, I have shipped some of Nixon's, but not for my employers.

2034. Have you had no experience of spontaneous combustion in shipping any of the other coals you have mentioned ?—I have had Fothergill's Aberdare under my notice and several of the Dowlais coals, which I consider very valuable coal, but very dangerous coal, so far as spontaneous combustion goes, if there is such a thing as spontaneous combustion. I should think it would generate gas very quickly.

2035. That would be inflammable gas, would it not ?—Yes.

2036. That is to say, it would be liable to gas explosion, but not spontaneous combustion ?—Just so. My private opinion is that most of the cases that are reported as cases of spontaneous combustion are merely from ignition.

2037. Are you aware that most of those cases occur after a lengthened voyage ?—No, I have not heard that.

2038. The evidence received by the Commission is that the cases of fire occur pretty generally towards the end of the voyage after the ships have been at sea a long time ?—I have not heard that.

2039. By that time the volatile gases would have passed off to a great extent, would they not ?—No, I think not. Probably they have kept the hatchways bunged up, and there has not been any proper ventilation, and then some fellow has gone down with a light and made the coal ignite, but, of course, they would not acknowledge that ; they would rather have it spontaneous combustion.

2040. Have you shipped patent fuel ?—I have shipped some fuel at Swansea, several cargoes of it.

2041. Have you ever heard of patent fuel catching fire ?—I have not.

2042. (*Mr. Fenwick.*) Is the coal which is shipped at Cardiff for the Peninsular and Oriental chiefly for short voyages for the Mediterranean ?—A great deal of it is shipped for India, quite half of it goes to India.

2043. Is that shipped in sailing vessels or steam vessels ?—Principally in sailing vessels. We ship to

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Bombay in steamers. Formerly we used to ship by sailing vessels.

2044. In what kind of ship is the coal for the Mediterranean carried?—Mostly in steamers.

2045. You do not advocate ventilation?—No, not internal ventilation, but surface ventilation.

2046. (*Mr. Icely.*) Will you inform the Commission what your instructions are with regard to the shipment of coal for the Peninsular and Oriental Company?—To see that we get coal instead of stones; that is all.

2047. Nothing beyond?—To see that the coal is carefully shipped?—The principal thing is to see that we get good coal according to contract.

2048. Have you any directions as to screening the coal?—We do not screen our coal now; we formerly used to screen it.

2049. Is not it even single screened?—It is screened at the pit's mouth; that is all.

2050. You have had no cases of spontaneous combustion in the coal you have shipped for the Peninsular and Oriental?—None whatever. I have only had one case of ignition. In that case the ship was loaded with ocean coal at Penarth. That casualty occurred about two days before she left the dock.

2051. If there had been any such cases, would they have come to your knowledge?—Yes. Of course inquiries would have been made as to the condition of the coal when shipped.

2052. When once the coal is shipped if any accident happens to the cargo, have the Peninsular and Oriental Company to suffer the loss?—They insure the cargo.

2053. Do you attribute this immunity from danger in the case of the Peninsular and Oriental shipments, compared to those of other people, to the careful inspection given by you as the representative of the Peninsular and Oriental Company?—No, I cannot say that.

2054. You do not think it is owing to their careful inspection that the immunity from danger has arisen?—I am rather diffident in answering your question, for I might be supposed to be lauding my own carefulness, but we see that the coal is in good order before it is shipped.

2055. There is no screening, I understand you to say?—Not lately. We ship it colliery screened.

2056. It is screened at the colliery, but not on shipment?—No, except on certain occasions. If I see the coal has got too much small in it, they screen it again upon my suggestion, but we do not pay for it screened; we pay for it colliery screened.

2057. (*Mr. Abel.*) You referred to one case of explosion on board a coal-laden ship; could you give us any details with regard to that?—*

2058. That is the only instance of explosion which has come under your personal knowledge?—Yes.

2059. Yet you consider explosion is the main danger to be guarded against in the shipping of coal?—Yes.

2060. You do not believe there is any great liability to spontaneous heating of coal?—Not in the coal I am speaking of.

2061. (*Dr. Percy.*) I think you said that you reject coal containing iron pyrites in any sensible amount?—Yes, I frequently do.

2062. Simply because the coal containing it would be of inferior value, not as I understand you, because you feared that spontaneous combustion might arise from it?—No, merely because I considered it inferior coal, having regard to the inferior qualities required of it as steam coal; not with regard to liability to spontaneous combustion.

2063. Is not it conceivable in the case of coal inspection that there may be such a thing as a very strong temptation offered to the inspector to pass coal of inferior value?—Quite conceivable.

2064. Where a man was not proof against temptation?—Quite possible, probable, and very likely exists.

2065. (*Mr. Duncan.*) Quite irrespective of inspection at all, there is a large quantity of coal shipped that is in your judgment unfit to be sent on long voyages?—A great deal.

2066. People buy a cargo of coal and take the chance of it?—They take the chance of losing the ship and everything else.

2067. (*Chairman.*) It is your view that a coal may be an admirable steam coal and very good for shipment for a short distance that ought not to be shipped for voyages of three and four months?—Exactly so; and no people having any knowledge of that coal would sent it on a long voyage.

2068. Do you know anything about the rate of insurance upon coal now?—No.

2069. You said that the Peninsular and Oriental insured their coal. Do you mean they insure it in their assurance fund?—They insure it at Lloyd's or in other offices. I think it is rather a considerable item with them.

2070. Their insurance fund only covers their own ships?—Yes, their cargoes are insured in outside offices.

2071. (*Mr. Duncan.*) Do you think, owing to the pressure there was during the last two years 1873 and 1874 to get coals, people were tempted to send away a class of coal that would not have been sent away at other times?—I think so, certainly. They would ship anything black.

2072. (*Mr. Vivian.*) You have stated generally that you consider ironworks' coal to be liable to spontaneous combustion and dangerous. Could you when you return home refer to the shipments of ironworks' coal and furnish the Commission with any data upon which your opinion is based?—No, I could not. It is only my personal conviction.

2073. It is an opinion based upon no facts whatever?—It is only my opinion.

The witness withdrew.

Adjourned to Tuesday next at 12 o'clock.

Tuesday, 6th July 1875.

PRESENT:

THE RIGHT HON. HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

Sir GEORGE ELLIOT, Bart., M.P.	JOHN FENWICK, Esq.
HENRY HUSSEY VIVIAN, Esq., M.P.	CHARLES ICELY, Esq.
FREDERICK AUGUSTUS ABEL, Esq., F.R.S.	JOHN PERCY, Esq., M.D., F.R.S.
RICHARD CORY, Esq.	WILLIAM YOUNG, Esq.
GEORGE DUNCAN, Esq.	J. M. CARMICHAEL, Esq., Secretary.

MR. EDWARD BENJAMIN SCOTT examined.

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2074. (*Chairman.*) You are a partner in the firm of Messrs. Gillespy and Scott?—I am.

2075. You have had great experience in the shipment of coal?—Yes, for a considerable number of years.

2076. Your firm has been established some years?—Since 1857.

2077. You have shipped largely for Her Majesty's service?—Yes, and our predecessor also, Mr. Thomas Gillespy.

* Mr. Roberts thought he would be able to furnish these details on his return to Cardiff, but he subsequently wrote:—"I regret "being unable to give any particulars of the reported case of explosion in a coal-laden vessel as referred to in my evidence before "the Royal Commission on Spontaneous Combustion in Coal (in No. 2057), as I find that upon the investigation held on this "case, it was considered doubtful whether it was an explosion of gas or ignited by a fire (that the coal itself was ignited by a fire "arising from the vessel's stores having first ignited").

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2078. From what ports have you usually shipped?—From all the coal-shipping ports, that is to say all the ports from which steam coal is shipped.

2079. Both in the North of England and in South Wales?—Yes.

2080. And from Birkenhead?—Yes, but principally from South Wales.

2081. You have paid some attention to the question which is referred to this Commission for consideration, viz. the spontaneous combustion of coal on board ships?—Yes.

2082. Will you tell the Commission from your experience what descriptions of coal appear to you to be most liable to spontaneous ignition on board ships?—I think it is more especially the smelting coals that are shipped for the west coast of South America that are liable to take fire; it is in those coals that we have noticed the greater number of burnings.

2083. Have you any details or particulars of any cases of such coal taking fire spontaneously?—Not of smelting coal; we have never shipped smelting coal ourselves; our experience has been almost exclusively in steam coal.

2084. Have you known any instances of steam coal having taken fire?—Yes.

2085. Will you give the Commission the particulars of any such cases?—The first case of which we have record is that of the "Mary Shepherd," in the year 1852. She loaded a cargo of Swansea coal. The coal was brought up to London at the time when the railway traffic in coal from South Wales to London was just beginning to be developed, and was shipped in the West India Dock. She went on a voyage to Shanghai; we traced her to the Straits of Sunda, and after that she was burnt somewhere in the China Sea.

2086. Have you any details of that casualty?—The vessel was originally classed A1. at Lloyd's for 10 years; and in 1852, when the shipment was made, she was four years old. She was a sailing vessel, built of wood, and believed to be tight. Her builders' tonnage was 550, and her registered tonnage 629. The coal was Resolven coal, from the Resolven colliery, and it was hand picked. The ships' hold was ventilated by a wooden trunk alongside the keelson, and two or three shafts thence to the hatchways. It is believed that the fire originated in the fore-hold. The coal had been on board at the time of the burning from four to five months. It was brought by the Great Western Railway from Swansea, to Bull's Bridge, near Brentford, and was conveyed thence by lighters to the West India Dock. It was a considerable time on the road; longer than would be the case at the present time. The coal was put on board from lighters brought alongside, and was lowered into the hold by baskets. The weather was wet during the loading. No record was kept of the weather during the voyage. The cargo was in the course of its transit from Swansea exposed to the weather to a considerable extent, and it was exceedingly wet at that time. With regard to indications of the cargo being heated before the fire broke out, there were hot decks for some time before the fire. With regard to whether the hold was completely filled up to the hatches, we cannot say exactly, but most probably it was not filled up to the hatches. The only suggestion that we ever heard made with regard to the cause of the spontaneous combustion was that the coal was shipped wet. At that time the subject did not attract the attention it has since done.

2087. Did you consider that the ventilation in that case had anything to do with either checking, or promoting the combustion?—At that time we did not. We thought that to ventilate was the proper thing, but it was entirely the owner's own act; that cargo was on his own account; we made no suggestion on the subject, I think.

2088. Have you any other case?—The next case we had was in the year 1855, that of a vessel called the "Robert Watson." She was built in Newcastle, in 1839. At the time of her being laden, on the 22nd October, 1855, she was classed at Lloyds Æ1. She was laden with 554 tons of Coed Talon steam coal. She put into Queenstown from stress of weather, where a portion of the cargo was landed while the damage to the ship was repaired. On her arrival at Constantinople the cargo was reported to be "heated, and "both bad and dangerous, full of iron and sulphur." This was shipped for the Admiralty, and I find that some communication was made to the Admiralty upon the report which came from Constantinople, but I cannot trace what the explanation given was. The letter-book says simply, "I have the honour to enclose "letter from shipper on the subject," without giving the particulars. That cargo was condemned and was sold there (at Constantinople). If I remember rightly the vessel was somewhat charred by the fire.

2089. Do you attribute that combustion to any special cause?—Coed Talon is a coal which we have always had some doubt about.

2090. Because it contains much pyrites?—Yes, that is the idea we have had of it always, but I could not positively say that that was the cause of the state of the Robert Watson's cargo.

2091. Was the ship ventilated?—I do not know.

Then again, during the years from 1857 to 1863, we shipped 372,000 tons of coal altogether, principally for Her Majesty's service, the Imperial Marine of France, and the Peninsular and Oriental. The bulk of the coal was steam coal, principally from Wales, but a portion was gas coal. We gave no instructions about ventilation, and we had no case of explosion or combustion reported during that period.

2092. Do you remember what coal that was?—I could not give you the names of the coals; they were the ordinary Cardiff steam coals on the Admiralty list at that time. They were all first-class coals; Nixon's Merthyr, Fothergill's Aberdare, Davis's Merthyr, Ocean, Nantmelyn, and others. During this period, from 1857 to 1863, all the ships carrying the quantity of coal I have mentioned were accounted for, except the "Marlborough," the "George Bradford," and the "Middlesex," which were missing, and the "Cassange" which was known to have been burnt. The "Marlborough" was a new high-classed British ship, which was loaded on the 24th of April 1875 with a cargo of Buddle's West Hartley steam coal for Shanghai. She is supposed to have been lost in a typhoon after passing the Straits of Sunda. The two other vessels, the "George Bradford" and the "Middlesex," were despatched to Halifax in January 1862, at the time of the "Trent" affair. They went away unusually early, and they were supposed to have foundered soon after leaving Cardiff, because another vessel named the "Force," that went away at the same period foundered also, but the crew were saved. The only case of burning that we know of out of all those shipments was the "Cassange," a vessel belonging to Messrs. James Thomson and Co., of Billiter Square. Her cargo consisted of 534 tons of Parson's Abbey Graigola coal, and it was shipped on account of private merchants for St. Helena. The bill of lading is dated Swansea, October 1863. She was 369 tons register, built at Sunderland in 1854, and classed at Lloyd's A 1 for 10 years. She was burnt on the way; I do not know at what particular part of the voyage. That carries us up to 1863. Then in the years between 1864 and 1874 we shipped 304,405 tons. That makes a total of nearly a million and a half of tons shipped over sea in the period I am speaking of; that is to say from 1854 onwards. All the vessels carrying these 304,505 tons, and also the coasting vessels, were accounted for and need no remark, except the "Princess Alexandra" and the "Pocahontas." The "Princess Alexandra" was a steamer laden in 1868 with 723 tons of unscreened Londonderry gas coal for Limerick; an explosion of gas took place in that vessel off Dover; the ship was set on fire and otherwise damaged, and some of the crew were injured and killed. About 100 tons of coal were taken out of the ship, and she went on and discharged the remainder of the cargo at Limerick.

2093. (*Dr. Percy.*) What was the name of the coal?—It was unscreened Londonderry gas coal from

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the Londonderry collieries. Then the "Pocahontas" was loaded with 1,580 tons of Hastings Hartley. That coal was shipped for Bombay under contract for the Council of India, and was shipped under the superintendence of Captain Steinson the inspector in the Tyne district. She was an American ship of 1,112 tons register, and at the time we took her she was classed in Veritas 5/6 1-1. She sailed from the Tyne on the 13th of July 1874, and was abandoned on the 10th September in latitude 20° South, and longitude 33° West. We had from the master a letter from which I have here an extract which I will read. He writes thus to Mr. David Brown who was the broker, "I arrived home all right two weeks ago. Four "Boston ships have been burnt this season within "two months of each other, and the accounts given "are about alike as to the cause of the fire. My ex- "perience, so far as regards ships taking fire is, the "coal heats, and being more or less sulphur in it of "course it ignites. In most every case ships have "taken fire in the hatchways where the fine coal is. "If ships could be loaded so as to avoid the fine "coals collecting in the hatchways, and some means "taken to prevent the coals breaking up, I do not "think fire would occur. I would not advise loading "the ship too quick; we was loaded in three days. "The coal should be perfectly dry and *not fresh* "*mined*. The only way that I know of, is to prevent "the fine coal accumulating in any place, and if "any ventilators is put in the hatches, I would "advise to put in as many as possible; say not less "than four in each hatch, in each corner; by that "way you separate the fine coal and it cools "quicker. One ventilator in my opinion is of no "account. I would platform the ship fore and aft, "so to give circulation of air under the cargo. Some "means must be taken to prevent the coals from "heating. I could not suggest anything different, "except loading the coals in large casks. Quite an "excitement is created here in the insurance com- "panies; some of the offices will not take a ship with "export coal at any rate; some have raised the rates, "as it would not pay to keep ships insured carrying "coal at the present rates." Then I have extracts from the log book, which give more details. The first entry from the log book bears date July 26th (13 days after sailing), when squally weather was experienced, and the ship laboured heavily. Then, on August 30th, 48 days after sailing, there is this entry: "An unusual "strong smell of gas was noticed in the fore between "decks at 5.30 a.m. At 7.30 a.m. blue smoke was "seen coming from the port side. The hands were "set to clear away and put coal in 'tween decks. At "the depth of six feet the heat and smoke prevented "further work. Water was thrown down, and about "15 tons of the burning coal jettisoned. When about "two feet from the keelson, the smoke stopped, and "no more burning coal was found." Then, on September 8th, nine days later, there is reported "A strong "smell of burning coal and a light grey smoke. This "smell continued throughout the night all over the "ship; and then a blue smoke was observed coming "out of the after hatch. On the following day, Sep- "tember 9th, the smoke increased, and more coal was "jettisoned till the hands got down to the 'tween "decks, when the heat and smoke prevented further "work. The hatches were then closed and the ship "squared away for Bahia. On the next morning the "smoke increased, and the water in the main tank "became very warm. The fire therefore must have "been in the lower hold somewhere aft of mainmast. "On the following day, September 11th, as the smoke "was coming out of the hatchway in dense volumes, "and the coals were heard 'cracking as if the flames "'might break out any minute,' the 'Pocahontas' was "abandoned. At 4 p.m. the flames burst through the "after hatch, and after burning fiercely until midnight "the vessel sank on the 60th day after sailing."

2094. (*Chairman.*) That is the last case you have?—Yes. The casualties that have happened among our shipments, which have amounted to a million and a half tons of coal since 1853, have been comparatively very few; it was not till we came to the year 1874 that we had any case of a serious character, namely, the "Pocahontas," and that ship was loaded with a coal in which we should never have expected such a thing to take place. I never heard of such a thing before as "Hastings Hartley" taking fire.

2095. In one passage of the letter which you read from the captain of the "Pocahontas" he speaks of the insurance offices at Boston being alarmed at the large number of casualties in coal-laden ships; is it your experience that of late years the percentage of cases of spontaneous combustion in coal-laden ships has increased?—Yes.

2096. And the effect has been to alarm the insurance offices both here and in America?—Yes.

2097. Have the premiums risen?—Very much. I should describe them now as being quite "fancy" rates.

2098. To what do you attribute that increase in the percentage of cases of spontaneous combustion?—I am quite at a loss to explain the cause of it.

2099. A great many causes have been suggested. By some it has been attributed to excess of ventilation, and by others to absence of ventilation. Have you formed any opinion on that point?—The opinion I have formed is that a ventilated ship is certain to be destroyed if combustion be once set up.

2100. You are averse to ventilation?—Yes.

2101. By ventilation you mean ventilation through the coal?—Yes.

2102. You would keep the surface of the coal ventilated, would you not?—As often as the weather would permit.

2103. So as to carry off the gases?—Yes, but that we have given so little heed to, that with the exception of telling the master to keep his hatches off in the first instance for 48 hours, we have never thought it necessary to give any special instructions either in the case of our own ships or in the case of any that we have chartered.

2104. As regards ventilation through the coal, you have formed a distinct opinion that ventilation through the coal is prejudicial?—Yes.

2105. Have you formed any opinion whether the increased number of these casualties is due to a different method of conveying the coal to the ship being adopted, or to a more rapid shipment of it, or any cause of that kind?—The only conclusion to which I can come, (but that to my mind is not satisfactory,) is, that in consequence of the increased cost of labour there has not been latterly the same care exercised that there was formerly in taking out the pyrites—in cleaning the coal.

2106. Do you attribute the whole or the majority of these casualties to the presence of pyrites in the coal?—I could not say that that is a positive conclusion to which I have come, but it is the only conclusion I have been able to come to.

2107. The captain of the "Pocahontas" speaks of the mischief arising from the accumulation of large quantities of small coal—is it your impression that small coal is specially liable to spontaneous ignition irrespective of the presence of pyrites?—I think it is; from its lying so much closer together—that is a condition which seems to favour the production and spread of combustion.

2108. Have you formed any view as to the special liability of particular seams of coal to casualties of this kind?—No; our opinion is adverse to North Wales coal and to the smelting coal of South Wales.

2109. But there is no special seam of South Wales coal which appears to be more dangerous than another, as far as your experience goes?—No, we do not know from what seams coals are shipped; we simply take a man's coals; he mixes them according to his own convenience. We only know the pit that the coal comes from, not the seam.

2110. Have you any experience of any special liability of north country coal to spontaneous combustion?—No; the only case we have had was the case of the "Pocahontas."

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2111. You have formed no conclusion as to the special liability of particular classes of north country coal to spontaneous combustion?—No, our evidence is rather negative than otherwise on the subject.

2112. (*Mr. Young.*) You said that you disapproved of ventilators altogether?—Yes, I think ventilation insures the destruction of the ship when combustion is once set up.

2113. You mean ventilation by wooden ventilators?—By the wooden ventilators which are usually used.

2114. Could not a ship be ventilated with metal ventilators?—Yes, she could be; but I think that the ventilation would tend to produce the destruction of the ship as I have already explained.

2115. Have you ever given any instructions, or have you ever known of any instructions being given to test the heat of the coal by the thermometer during the course of the voyage?—No, I have not. We have never given any instructions ourselves with regard to ventilation; our ships have been small ships, and we have shipped our cargoes in the usual way without ventilation.

2116. It appears that during the year 1874 there were more cases of spontaneous combustion than usual. Do you think that arose in any way from the ships not perhaps paying so well, the cost of them being greater than usual, insurances being higher, and captains not being so careful to stick to their vessels than at other times?—No, I have not the slightest idea that that would have anything to do with it.

2117. Do you find that more vessels are lost when they cease to pay than when they are paying?—That does not come within the range of my experience.

2118. In 1874 there were more cases than before—you do not think that the inference to be drawn from that is that the vessels were not paying the shipowners?—I have not any idea of any connection between the two things.

2119. (*Mr. Cory.*) Do you think, as far as your experience as a shipowner goes, that the captain of a ship knows anything about the insurance at all?—Frequently he does not.

2120. Do you yourselves inform your captains that your vessels are insured?—We say this—it is almost a stereotyped form—"The ship is insured; principally "in clubs, but on all occasions you are to please to "bear in mind that you are to act as if we were not "insured."

2121. (*Mr. Abel.*) You stated that you entertain a decided opinion that ventilation is prejudicial to the safety of a coal cargo, can you give a precise reason for that opinion?—I said this, that where combustion is set up I think the effect of ventilation is to insure the destruction of the ship; that is, it soon becomes unconquerable.

2122. You draw a distinction between the effect of ventilation as promoting combustion or heating when once it is established, and as giving rise to the first development heat?—Yes, I should say it would tend to prevent heating in the first instance, but if it is not successful in preventing the heating, then it insures the destruction of both ship and cargo.

2123. You think if it were possible to have a sufficiently efficient mode of ventilation it would be decidedly safe to adopt such a system of ventilation, and that it would tend to prevent spontaneous heating?—If you could ensure a sufficiently efficient mode of ventilation, but the question is how to ensure it.

2124. With regard to the condition of the coal as loaded, that is to say the size of the coal, do you believe that is a matter closely connected with the question of ventilation?—Where there was a large quantity of small coal I think it would be more likely that there would be impurities in the coal.

2125. It is not because you think that the coal would be less ventilated where it was small than where it was large that you consider it would be more liable to ignite spontaneously, but because the small coal contains more impurities?—I think the two things come in; there would, in the first place, be more impurities in the small coal than in the large, and next, from lying so close together, the effect would be more rapidly to increase combustion.

2126. I understand that an accumulation of small coal is caused, in a great measure, from the manner in which the coal is loaded on board ship; that it collects at the hatches, where the coals become more or less broken up?—Yes.

2127. Would there be more impurity in that coal because it happened to be in small particles than if it were in large lumps?—The impurities, in the way of pyrites, would be picked out of the large lumps when it could not be seen in the small; but the accumulation of small coal in the hatchway would arise from the fall of the coal in that particular spot, and there, I apprehend, there would be a want of ventilation, from the coal lying more closely together, and it would be there that combustion would be likely to take place.

2128. The effect due to the smallness of the coal in the hatchways would be an effect apart from that due to impurity of the coal?—Yes

2129. In the single case of explosion which you referred to, was there any damage done?—The ship was set on fire by it.

2130. Was the coal set on fire?—Yes, the coal was somewhat burnt—nothing to speak of; it was left behind in order to lighten the vessel.

2131. Was the vessel ventilated?—No, she was a steamer. She was loaded in a few hours, and there was no arrangement for ventilation.

2132. Was that vessel overloaded?—No. I forget her tonnage now, but she only carried 720 tons of coal. That was about her average cargo. She belonged to a company in Limerick, and she went round from Sunderland to Limerick. It was off Dover that the explosion took place.

2133. (*Dr. Percy.*) Are some smelting coals according to your experience more liable to spontaneous ignition than others?—We are not shippers of smelting coal.

2134. You expressed an opinion that such coal was more liable to spontaneous ignition than any other kind of coal?—Yes.

2135. You do not know whether certain kinds of that coal are more liable to spontaneous ignition than other kinds?—No.

2136. With regard to the presence of pyrites in such coal, have you any experience upon that point?—No, we have not.

2137. You spoke of a cargo of Coed Talon which was shipped in the "Robert Watson," which afterwards took fire, and which you said was full of pyrites. Was there any Admiralty inspection of that cargo?—No; that was before the Admiralty inspection took place. The Admiralty inspection was not established till 1859, and that casualty happened in 1855.

2138. Have you any personal knowledge yourself of any case of spontaneous ignition—have you watched the conditions under which such spontaneous ignition has occurred?—No, I have never had an opportunity of doing that.

2139. Have you any experience of the effect of the atmospheric temperature in promoting spontaneous ignition?—No.

2140. Do you think an elevated atmospheric temperature would be likely to promote ignition?—As a matter of theory, I should say so.

2141. With regard to the cleaning of coal from pyrites, is not it the case that very frequently coal contains pyrites in pretty large quantities which is not in lumps which could be picked out?—I believe so.

2142. Have you any experience with regard to the spontaneous ignition of such coal as that?—No.

2143. (*Mr. Duncan.*) Your experience would lead you to say that the best class of steam coal, when it is well cleaned, is not liable to spontaneous ignition at all?—That is the result of my experience.

2144. Upon the question of ventilation, I suppose your opinion is not based at all upon scientific considerations; that is to say, you do not consider whether the pyrites derives oxygen from the air

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passing through it or otherwise?—No, it is not based upon that. We do not go into the scientific part of the question.

2145. You think if a ventilator were put into the coals, and the coals were set on fire, it would act as a chimney, and therefore would cause the fire to burn fiercer?—Yes.

2146. You do not base your judgment as to the advantage or disadvantage of ventilation on any scientific considerations?—No; it is a sort of rule of thumb decision that we have come to upon the matter.

2147. (*Sir George Elliot.*) I think I remember your name as a buyer of coals for more than 20 years in the north of England?—My firm and our predecessors have been buyers for more than 30 years.

2148. And you say you have purchased a million and a half of tons?—Yes, since the year 1854 Mr. Thomas Gillespy and ourselves have shipped nearly a million and a half tons.

2149. What proportion of those coals would you take from the north of England?—In the first period, 1854, 1855, and 1856, I should say fully half; subsequently it would be about two thirds Welsh coals, and one third north country.

2150. Out of all those shipments since 1854, how many cases of spontaneous combustion have you had in north country coal?—The "Mary Shepherd" was before that date; that was 1852; that was Welsh coal. The next case, the "Robert Watson," was Coed Talon, North Wales coal, then the "Cassange," was South Wales coal. The only cargo of north country steam coal was the "Pocahontas."

2151. You have been shipping from the Tyne during a period of 20 years, about a third of that 1,500,000 tons of coals, that is to say 500,000; and you have only had one instance of spontaneous combustion in north country coal?—Yes.

2152. And I understood you to say that you thought that casualty might have been due to the regular system of cleaning coal not having been attended to?—That was the idea I formed about it as a matter of theory.

2153. As to ventilation, you do not seem to attach much importance to ventilation as a protection against spontaneous combustion?—No; we have never taken any precautions of that sort during the whole of that time.

2154. You have carried all this large quantity of coals up to 1874, shipping a great variety of north country coal from the Tyne; and you have had no instances of spontaneous combustion except that one of the "Pocahontas?"—That is all.

2155. And that was Hastings Hartley?—Yes.

2156. Coed Talon you say contains rather a large proportion of pyrites?—The report that came to us was, "Heated, and both bad and dangerous; full of iron and sulphur." That is the report of the Admiral. I believe it was Admiral Stewart.

2157. With respect to the case of the "Princess Alexandra," there was no spontaneous combustion there?—No; that was simply a case of explosion.

2158. In the case of the "Pocahontas," which loaded with Hastings Hartley, how many days was she out before the spontaneous combustion took place?—48 days after she sailed there was an unusually strong smell of gas; nine days later there was a strong smell of burning and a light grey smoke.

2159. Does anything occur to your mind that you would suggest with a view to prevent the occurrence of these casualties?—No; I have not been able to come to any satisfactory conclusion about the best way of preventing them.

2160. (*Chairman.*) Upon the whole you would recommend that coal cargoes should not be ventilated through?—Judging from experience I come to that conclusion.

2161. As to the method of shipment, there are several methods in force in the north, at Liverpool, and in South Wales. There is, first, the common shipment from the tip, and, secondly, shipment by boxes?—That is almost abandoned in Wales.

2162. Then there is a third plan of shipping by barrows?—They ship by barrows at Birkenhead.

2163. And also in bags occasionally?—That plan may be adopted in shipping coal for smelting purposes. I have no experience of that.

2164. Have you formed any strong opinion as to the advantage of one system over another?—No; I think looking at the peculiar quality of the coal, each mode seems to be well adapted to the particular coal. For instance, in the Welsh coals, there is a careful letting down of the coal by the tip, which slopes down to the ship and forms a screen when required. After the appointment of the Admiralty inspector, which was in 1862, we began to double screen, that is to say, to screen at the time of actual shipment, the small coal being taken away. That system has been given up of late and now we ship generally single screened for the Admiralty.

2165. The coal going from the tip with a heavy fall?—No, not with a heavy fall; it goes down the same incline, but there is no screen to take the small coal away.

2166. Do you think it desirable that there should be the least possible fall into the hold?—Certainly.

2167. It is not very material which plan you adopt provided that result is arrived at?—Quite so.

2168. (*Mr. Vivian.*) You mentioned one case of Resolven coal having fired, have you shipped other cargoes of Resolven coal?—Yes, but generally speaking only coast-wise; it is a very tender coal. We have shipped it largely principally to Devonport dockyard, and as far as Gibraltar, but I do not think any further. I believe it has been shipped over sea, but not by us.

2169. (*Mr. Icely.*) You were speaking of coals on Admiralty list. I presume the varieties on that list are coals of which the Admiralty approve?—Yes, for their particular purposes.

2170. Have they a list of the coals of which they disapprove?—Not that I am aware of. The condition of the Admiralty contracts was "that the coals to "be shipped were to be of such and such descriptions "at the option of the Lords Commissioners of the "Admiralty." Practically we knew that for certain purposes Resolven would do, and we knew equally that for certain other purposes we could not send Resolven, but must ship other coals named. At times the then Storekeeper-General used to come down with his big hammer, and by ordering "Nixon's navigation," for which we had to pay a heavy price, remind us that he, and not we, held the option of selecting the coal to be shipped.

2171. (*Chairman.*) That system is not in force now?—No.

2172. (*Mr. Duncan.*) Putting coals on the Admiralty list amounted to this, did it not, that the owner of a particular colliery submitted his coals to a test, and if they went through the test satisfactorily to the Admiralty he was allowed to put the coals upon the list?—Yes, they were then put on their list.

2173. As a rule it was the parties who owned the coals who submitted their coals to the proper test, and if they passed such test, they were allowed to be put on the Admiralty list?—Yes, the Admiralty kept the control in their own hands as to what we should ship. Resolven would answer the purpose if it was to be used in Devonport dockyard, for instance; but for over sea we should have had to take a higher class of coal.

2174. (*Sir George Elliot.*) The Admiralty did not shew any caprice in the matter; any person who had a suitable coal, applied to have it tested, and if it came up to the test, it was at once placed on the list?—Yes, there was nothing capricious about it.

2175. (*Mr. Young.*) Have you ever known a case of spontaneous combustion in a store of coals on shore?—Yes, in the case of gas coals at Limerick, and also at depôts abroad. I have heard of it.

2176. In those cases were the coals exposed to the weather?—Yes.

2177. I understood you to say that you thought that coal shipped wet was more liable to take fire than

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coals shipped dry?—That is the conclusion I have been compelled to arrive at.

2178. Would not it then be probable that if great quantities of coal were stored in the open air they would be liable to spontaneous combustion?—Yes, and it frequently takes place. I have frequently heard of cases of spontaneous combustion of coals stored in the open air.

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The witness withdrew.

Mr. John Glasbrook examined.

Mr. J. Glasbrook.

2179. (*Chairman.*) You are a colliery owner and mining engineer at Swansea?—Yes.

2180. Have you been engaged in shipping coal many years?—Yes, upwards of 30 years.

2181. What descriptions of coal have you been shipping?—Steam coal, mining coal, and house coal. We have only shipped one cargo of smelting coal, that was to the west coast of South America.

2182. Can you give us any information with regard to the liability of particular descriptions of coal shipped at Swansea to take fire spontaneously?—There are only two that are sure to go without spontaneous ignition, those are the 4-feet vein and the 6-feet vein.

2183. The other seams you look on as dangerous?—Yes, they contain impurities. We know that some coals will even take fire on the wharf if kept in too great a quantity. In fact if you have only 10 tons of coal from some of the veins it will take fire; that is the case with coal from the Cistern. I have proved it myself.

2184. (*Mr. Vivian.*) What do you say to the 5-feet vein?—The 5-feet vein is very bad.

2185. What do you say to Hughes's?—Hughes's vein is better than the rest, with the exception of the 6-feet. Hughes's is the next best to the 4-feet and the 6-feet; the 3-feet is very clean, but there is something in it that would deter shippers from shipping it.

2186. (*Chairman.*) You are speaking of Swansea coal?—Yes. This (*producing a diagram*) shows all the veins. This is the 4-feet, that is a good vein. Then here you have the 5-feet which is not a good vein. This is the 6-feet, which is a good vein; and this (*pointing to Hughes's*) is good if it is worked clean. I do not know much about the others. We own about 16 ships, and whenever No. 1, No. 2, or No. 3 Rhondda has been shipped it has taken fire.

2187. What experience have you personally of cases of spontaneous combustion?—One of our ships took fire last year. That was named the "Alpha."

2188. That is the only case of which you have personal experience?—Yes.

2189. In the evidence you have given you have been speaking generally as to your knowledge of the different coals of the district?—Yes.

2190. You also said that you had personal knowledge of coal taking fire on the wharf?—Yes, coal from the 5-feet vein. The Forest colliery has taken fire with us. Coals from the 6-feet and the 5-feet mixed together have taken fire. If you put any 5-feet with anything else there is a danger of its taking fire.

2191. You could put your finger on certain descriptions of coals and say, "These are unfit for shipment for a long voyage"?—Yes, large might go very well, but through and through will not.

2192. There are certain descriptions which you would say could not be safely shipped except for a short distance?—Yes, some of them will go a short distance safely, but some of them I would not trust for five days or seven days.

2193. From what seams would that coal be?—The seams above Hughes's, the Cistern, the Slatog, and the Bodor, that coal is very unfit to go anywhere, there is such a mixture of pyrites and shale in it, shale is the most dangerous thing of any, it contains so much oil and it gets heated. There are veins of coal containing small rods of small slaty stuff, and that breaks up with the small coal, and it is liable to take fire.

2194. What in your opinion are the causes of spontaneous combustion?—Impurities in the coal such as shale and dirt and earthy matter.

2195. Shale and earthy matter and pyrites?—Yes, and what is called "mother of coal" it is very good to burn, it makes very good coke.

2196. (*Dr. Percy.*) It is almost like charcoal?—Yes. I have some specimens of coal here. This (*producing a specimen*) contains a great deal of what they call "mother of coal" that is No. 3 Rhondda. This (*producing another piece*) is a piece of coal without any impurities whatever in it; that is sure to go without ignition, that is from the 6-feet vein.

2197. (*Chairman.*) Do you observe that these casualties have increased lately?—Yes, on account of the men not working the coal clean.

2198. Is that the only reason of the increase?—That is one of the principal reasons why there have been so many cargoes taking fire lately, that we cannot get the men to work the coal clean. They say, "If it does not suit you we will leave it."

2199. (*Dr. Percy.*) There seems to be pyrites in that coal which you say would be sure to go without ignition?—That is fat, I do not think there is any quantity of pyrites in it.

2200. (*Chairman.*) You say that one of the principal causes to which you attributed the increased number of casualties lately is the carelessness of the men in not working the coal clean?—Yes, people have been shipping coals that they would not ship at other times.

2201. The rise in the price of coal has induced the colliery proprietors to ship inferior coal?—Yes, they would ship coal which they would not have shipped at other times.

2202. Is the risk of spontaneous combustion taken into consideration, do you think, by persons shipping inferior coal?—The shippers do not care much what they take so long as they can insure the cargo, the shipowners have to look to that; we only take the 4-feet or the 6-feet in our ships.

2203. You consider that there was greatly increased carelessness in this respect while the price of coals was high?—Yes.

2204. Now that coal has fallen are shippers more careful?—Yes, they will not take any sort of coal now.

2205. Have you formed any judgment as to the advantage or disadvantage of ventilation in coal ships?—I believe separation is better than ventilation, I mean keeping the coal in compartments, small cargoes are not so liable to ignition as large ones. It is just the same as in the case of a large rick of hay, a large rick of hay is more liable to take fire than a small one when the hay is damp.

2206. You mean separation in the ship itself by the coal being placed in separate compartments?—Yes, I should divide the coals into compartments by a three-inch plank or something like that; copper ore vessels are fitted up with trunks and those trunks could be made into separating apparatus very well.

2207. Has that been practically done?—I do not think so; they take no such precautions generally.

2208. That is the precaution which you would take?—Yes, to separate the ship into three or four compartments, that would be in the case of coal which was liable to ignite spontaneously. There is some coal that does not require anything.

2209. As to the coal that would be liable to ignite, you would take that precaution of dividing the ship into compartments?—Yes, and ship the coal dry.

2210. As a shipowner you would limit your shipments to those two veins which you have described?—Yes.

2211. And you would not ship any coal from any other veins?—No, I would not take a cargo of any other description, we do not ensure our ships, and we are obliged to be very cautious.

2212. Have you studied the different methods of

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shipping coal?—There are many modes of shipping coal. I ship my coal in boxes by the steam crane. That is a very good mode of shipment.

2213. That is an expensive method, is it not?—No I think we save in labour after all.

2214. It does not add to the costs of loading?—No, I do not think it does.

2215. Will you describe that method?—Here is a box about a ton weight that is drawn up by a steam crane and dropped into the hold of the vessel; then they knock the bottom of the box off and the coal spreads away without any pressure to speak of instead of being dropped down and pounded as it is by the tipping process.

2216. So that the coal does not fall far?—No; and the trimmers move it away as it falls.

2217. That is really on the whole not more expensive than the common method?—No, I do not think it is.

2218. Summing up the remedies you have suggested, they are these. Only to ship coal which is not liable to ignition from the seams you have mentioned (that is speaking of Swansea coal); secondly, not to ventilate; and, thirdly, where the coal is liable at all to ignite, to divide the ship into compartments; and, fourthly, to lower the coal in boxes, trimming the coal at the bottom and so avoiding any fall?—Yes, I would not object to those large shoots that they have for shipping coal, because the coal goes in as easily as by our boxes.

2219. That is to say the shoot which goes down actually into the hatchway?—Yes, the coal drops by degrees.

2220. (*Mr. Vivian.*) You would fill up the hatchway by means of boxes?—I should prefer to fill it up by boxes if possible, especially in the case of smelting coal.

2221. (*Chairman.*) Those are all the suggestions you would make?—Yes.

2222. Do you think any of them should be enforced by law, or would you leave it to the shippers?—I think you might very well leave it in the hands of the shipowners and the persons who ship the coal, but I believe it would be very beneficial if you could compel the men to work the coal clean. You have been legislating all for the men and the rest for the masters lately.

2223. You think something ought to be done in the other direction?—I think so. We take care that the working people have their food unadulterated, and they ought to give us coal without adulteration where it is possible to be avoided.

2224. (*Mr. Vivian.*) You are working the 5-feet vein yourself, I believe?—We are working it at Forest.

2225. And you contemplate working it again?—Yes.

2226. So that the evidence you have given in regard to the 5-feet vein is against your own interest, you being yourself a proprietor of a colliery on that vein?—Yes.

2227. Have none of the coals wrought from the 6-feet vein in collieries to the westward of Swansea, and shipped to the west coast of America fired?—None, if they have been shipped alone. Sometimes they smuggle some of the 5-feet and some of the 3-feet vein with it, and then it is sure to take fire.

2228. (*Chairman.*) Who smuggles those coals in?—The colliery proprietors; sometimes they are short of the other coal.

2229. (*Dr. Percy.*) Can you tell the coal when you see it?—No; you must watch it, the 3-feet is very clean, and so is the 5-feet sometimes, but still there is a great deal of alum in the 5-feet.

2230. (*Mr. Vivian.*) The water coming from the 5-feet is very bad, is it not?—Yes.

2231. (*Dr. Percy.*) Very bad for steam boilers?—Yes; it will eat a hole in a shovel in a night.

2232. (*Mr. Duncan.*) That is from the alum contained in it?—Yes.

2233. (*Mr. Vivian.*) The price of the 5-feet, the 6-feet, and the 3-feet is the same, is it not?—Pretty much the same.

2234. So that the only object would be to fill up the ship?—Yes, when they were short of coal. There is a great demand for the 6-feet, and it is better than the other, but they will sometimes ship the others with it. I know Mr. Sterry has been short of the 6-feet, and he has plenty of the 5-feet.

2235. You have never known a case of the 4-feet firing?—No.

2236. There is very little of the 4-feet shipped over sea, is there not?—They used to ship a great deal of it from Primrose to South America; there is very little of it left.

2237. You mean that quality. There is plenty of the steam coal left?—Yes.

2238. You have shipped large quantities of the 5 feet for short voyages, have you not?—Yes, to Cornwall for instance.

2239. It is lying in heaps in Cornwall without firing, is it not?—Yes, mixed with other coal in layers.

2240. Have you ever known any case of patent fuel firing?—No.

2241. Do you believe it possible for patent fuel to fire?—No; unless it fires from an explosion of gas the same as steam coal.

2242. It will not spontaneously ignite?—No; you can build it up in chimneys and separate it in any way you like. I never heard of a cargo of patent fuel taking fire.

2243. Nor of explosion?—No.

2244. We have had some evidence as to Tyr Edmund taking fire?—That is sure to take fire if mixed with Abbey Graigola.

2245. What vein is that in the Swansea coal measures?—That is above the 6-feet.

2246. That would come under the class of veins which you mentioned as likely to take fire?—Yes, it is sure to take fire if mixed with the 6-feet; it is full of impurities.

2247. The Abbey Graigola is much the same, is not it?—The Abbey Graigola is the 6-feet vein; that is clean and always goes without danger.

2248. They work the Tyr Edmund with it?—Yes, they ship it with it.

2249. So that if you heard of Abbey Graigola taking fire you would think that some Tyr Edmund had been shipped with it?—Yes, there is no mistake about it.

2250. You would recommend that coals from veins which are known to be spontaneously ignitable should not be shipped for long voyages?—Yes; I should keep them at home for the manufactories and ship the others.

2251. You spoke of the Rhondda veins being liable to spontaneous ignition, can you mention any specific cases of Rhondda coals having fired?—I believe that every ship that went from Cardiff with Rhondda coal Nos. 1, 2, and 3 during the scarcity of coal took fire. Four cargoes of Cardiff coal ignited last year, viz., "Lady Heathcote," 527 tons; "Admiral Fitzroy," 550 tons; "Ermenigilda Donovara," 1,100 tons; and "Clothilde," 746 tons.

2252. Shipped on long voyages for smelting purposes?—Yes.

2253. That is not steam coal?—No, steam coal goes safe enough; that is shipped large, and there are no impurities in it.

2254. Does it increase the cost of shipment much to fill up the hatchway by means of boxes in the first instance?—No, nor even with baskets.

2255. Having filled up the hatchway by means of boxes to a certain extent you go on tipping in the ordinary manner?—Yes, because the men can shift the coals.

2256. Have you seen the mode of shipment adopted in the New Alexandra docks at Newport?—No; I believe it is pretty much the same as that adopted at Swansea at the new drops. They have a crane at Swansea and I see the same at Newport.

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2257. Your recommendation would be that to each drop there should be a jib attached?—Yes; I would have the first 100 tons shipped by means of boxes, it would not increase the cost much.

2258. To fill up the hatchway?—Yes, that would save the coal from breaking so much.

2259. With regard to the fires which you say occurred from Rhondda coal, did those fires occur previously to the last three years or during the last three years?—I believe there was none of it shipped before the last two or three years. I believe the shipments of coal to South America were confined entirely to Swansea and Liverpool.

2260. It was the want of coal at Swansea that drove shippers to Cardiff you think?—Yes, that drove them to take Rhondda coal from Cardiff; I believe the Morfa went very well.

2261. You never heard of a case of the Morfa taking fire?—No.

2262. The other veins in the Rhondda valley except those you mentioned are not liable to catch fire?—I never heard of one.

2263. (*Mr. Cory.*) Is it a common thing in your district for the same colliery to work the coal from several seams?—Yes; they bring up the same shaft the produce of the several seams, but generally they have separate tipping places for it.

2264. The coals from all those various seams come up at the same time?—No; not in the same tram.

2265. At the same time?—No; they will raise what they call "a party," that is 10 or 12 trams in one vein, and then they will raise a "party" in another vein.

2266. Do not you think that if a colliery was in full work there would be a considerable chance of a mixture taking place under such circumstances without the coal owner intentionally mixing the coals?—They never do mix them, they keep them separate the 3-feet vein generally is all sold for the works, it works very small, and the other works very large; the large is shipped and the small is sold to the works.

2267. Do you think in the case of a considerable pressure of business the people at the colliery could succeed in keeping the produce of each vein separate?—As far as I understand they do it. I always do it when I work coal. I have been working many seams in the same pit, and always separated them.

2268. (*Mr. Vivian.*) You can not only keep the produce of each vein separate, but you know what man has worked each tram, do you not?—Yes.

2269. And you know from what portion of the ground it comes, so that if you have different royalties you can distinguish the one from the other?—Yes, the name of the cutter is on the tram, and they tip one man's coal into one shoot and tip another man's coal into another.

2270. (*Mr. Cory.*) When the coal is delivered down those shoots it goes into trucks?—Yes.

2271. What sized trucks?—10-tons trucks.

2272. You do not consider that the coal is liable to get mixed?—No, unless it is done on purpose.

2273. (*Mr. Fenwick.*) I understand that you do not insure your ships?—No, we do not insure them, we put so much by for an insurance fund; *i.e.*, the Swansea Merchant Shipowners Company's ships.

2274. Have you always done that?—Yes, after we had 10 ships. We acquired our ships gradually, and when we acquired 10 we did not insure.

2275. You have not insured since the premiums have risen?—No, nor before. We did not insure after we had the first 10. The "Alpha" luckily was insured, she was one of the first 10, the others have gone safely.

2276. As a matter of business do you gain by insuring yourselves?—Yes, at the present freight it would take all the profit. We get enough in the year out of the 16 to purchase a new ship to replace one if she is lost.

2277. (*Mr. Icely.*) What is the general impression at Swansea with regard to the ventilation of ships, is it in favour of it or otherwise?—The overlooker of our own ships, Captain Pear, thinks it is better not to ventilate, he thinks it is better to select your coal and not ventilate; if you ventilate in good coal you do no harm; if you ventilate in bad coal you assist the burning after it once ignites.

2278. You are in favour of no ventilation at all?—I am in favour of separation.

2279. Do not you consider surface ventilation at all necessary?—Yes, I think it is advisable to keep the hatches off as much as you can.

2280. Would you do anything else in the way of ventilation besides keeping the hatches off?—I would have a pipe something like what you have for the ventilation of steamers.

2281. That is only to prevent danger from explosion?—Yes, it is almost in the bottom that the spontaneous ignition begins.

2282. Do you not think that pipes passing through the cargo and leading to the surface would be an advantage?—I do not think they would do any harm. You could then ascertain if there were any heat in the coal. I should like to have one or two to test whether there was any heat. You could do that by lowering a thermometer. I do not think it would do any harm, in fact I think it would do good.

2283. Have you given any instructions to the captains of your ships with regard to taking the temperature of the cargo?—I have not the management of the ships. We keep a manager and a secretary.

2284. You leave it entirely to them?—Yes, we have an experienced man as manager. He has been 25 voyages to south America, and he is a very experienced man, and a very intelligent man. We leave it all to him.

2285. I understand you that you have had no casualties among those 16 ships except the one you mentioned?—Where there was a mixture of the 4-feet and the 5-feet coal.

2286. Your impression is that that was the cause of the casualty?—We are certain of it, because if this 6-feet is shipped by itself it never takes fire, either wet or dry. It cuts in cubes and does not produce so much dead small dust.

2287. (*Mr. Young.*) Did all your 16 ships go to the west coast of South America?—Yes, with the exception of one of them, I think, which went to China or the West Indies.

2288. You have shipped coal in those ships at all periods of the year?—Yes, every month of the year.

2289. You are very careful as to the kind of coal you allow to go into your ships?—Yes, we only allow the 4-feet or the 6-feet to go into our ships.

2290. Because you do not insure?—Yes.

2291. Is it within your experience that during the two or three years when the price of coal was high, Nos. 1, 2, and 3 Rhondda was often shipped in other vessels?—I have not heard of it.

2292. I understood you to say that those coals had been mixed with other coals?—No, I said the 5-feet has been mixed with the 6-feet in some cases.

2293. Did the shipowners know in such cases that the colliery people were putting on board the 5-feet instead of the 6-feet?—No, but they know it now. A cargo of Rhyd-y-ffad went on fire lately.

2294. Your experience has led you to this conclusion, that if everyone was his own insurer there would be no necessity for legislative interference, every man would look after himself?—Yes; we shall never ship a cargo again without seeing what we get.

2295. You say that the coal from the Cistern veins is apt to take fire even at the pits' mouth?—You might have 10 tons down out of the pit to-day, and to-morrow you could not put your hand in it, it would be so hot.

2296. If that were shipped even for a short voyage it would be liable to take fire?—It would take fire before the ship was loaded. That is the Cistern vein, the next but one above the Hughes's vein.

2297. Have you ever known great quantities of coal lying on shore to take fire?—I never saw any coal take fire but the 5-feet.

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2298. (*Mr. Vivian.*) Is anyone working the Cistern?—Yes, Mr. Daniel.

2299. He works it for his own works, does he not?—He does not ship any.

2300. (*Mr. Young.*) Supposing a lot of coal to have a certain quantity of this 5-feet in it it would probably take fire?—Yes, that is to say, supposing it had some of this Cistern in it. The 5-feet is not so bad if it is worked clean.

2301. If any of this Cistern coal got into a lot of any other coal it would be likely to spontaneously ignite?—Yes.

2302. That is your experience?—Yes.

2303. (*Mr. Abel.*) With regard to these veins which you have described as being liable to ignite spontaneously, do you ascribe that liability to the character of the coal or to the impurities it contains?—Both. The coal contains impurities not so much in the way of shale and dirt as other impurities.

2304. Are the impurities in those particular coals so distributed through the coal that no amount of cleaning removes them?—They are in the nature of the coal.

2305. What are those impurities?—I believe sulphur and phosphorus.

2306. You said that the presence of shale and porous coal like "mother of coal" was more dangerous than pyrites?—That "mother of coal" is very dangerous, because it goes small amongst the coal, and if it is wet or damp it will heat. There is a great deal of vegetable matter in the "mother of coal, and there is a great deal of oil in shale.

2307. Some of those coals which contain a large quantity of shale and "mother of coal" do not contain much pyrites?—That is so; you can hardly sit in a room where this Cistern vein is burning, there is such a strong smell of sulphur.

2308. That shows that there is a great deal of pyrites in the Cistern vein?—Yes.

2309. Is there much shaly material in that vein?—Yes, there is some of that too.

2310. In some of the other coals the pyrites is small, but the shale and porous coal is considerable?—Yes, if you look up some of the knobs you would find that almost half would be shale.

2311. (*Dr. Percy.*) You say that if you stored 10 tons of that Cistern vein coal it would fire?—Yes; I might put 10 tons of it down to-day, and to-morrow I could not put my hand in it.

2312. Is that a hard coal?—No, not very hard.

2313. It will not stand weathering I suppose?—It will get as white as lime if you put it in the atmosphere a short time.

2314. Have you put your tongue to the coal to ascertain whether it tasted of iron?—No.

2315. Have you ever examined the white stuff that appears on the coal?—Yes, there is a great deal of salt in that, I think, and alum.

2316. Have you ever put your tongue to it?—There is a great deal of alum in the 5-feet.

2317. What leads you to say that there is phosphorus in the coal?—My impression is that the Cistern vein coal contains a great deal of phosphorus.

2318. Is that an impression merely, or a conclusion to which you have come from any chemical examination?—I have not had it analysed.

2319. (*Mr. Duncan.*) You have been asked whether the shipowners could prevent these bad coals from being put on board; many of them would not have the same facility of preventing it that you have?—No, not those at a distance unless they had an agent.

2320. If they had an agent he might be a man that they could not depend on?—Yes.

2321. The underwriters sometimes raise a question with regard to the coal a shipowner is proposing to take in his ship?—Yes.

2322. You mentioned that the coals from some of those veins, for instance the 4-feet and the 6-feet, might go safely if they were clean worked?—Yes, Hughes' vein is as pure as any vein if properly worked, but there is a bed of rubbish on the coal and another in the seam, and the bottom sometimes is bad while at other times it is good.

2323. Both the colliery owners and the miners are perfectly cognizant of those bad parts?—Yes.

2324. And as a rule the colliery owner does not want to have those bad parts wrought along with the others, but the miners are not careful to avoid working those bad parts?—If we could prevail on the men to work the coal clean the coal would be marketable in any case, that is the Hughes vein.

2325. It is a fair and legitimate inference that a good deal of this spontaneous combustion has arisen from the people at the colliery mixing this 5-feet coal which you think dangerous along with the 4-feet and the 6-feet when there was great pressure to get coal?—Yes.

2326. They were of the same value, and therefore the owner without thinking of the risk of spontaneous combustion would think that he might as well have the ship filled up instead of detaining her by which he might be incurring 20*l.* a day demurrage?—That is very often the case no doubt.

2327. You think if pure steam coals were shipped at Cardiff in a proper state the risk of spontaneous combustion would be very small indeed?—There would be no risk at all.

2328. And the same with regard to coal shipped at Swansea?—Yes; I never heard of a cargo of steam coal taking fire at all.

2329. It is the smelting coal that you have been speaking of as being so liable to take fire?—Yes; I am shipping a great deal of steam coal, but I never heard of any of it taking fire.

2330. You hold that even the small coal which is shipped for smelting purposes would be safe enough if taken out of the 4-feet and the 6-feet?—Yes, there would be no danger. I would insure a ship directly that carried it.

2331. (*Sir George Elliot.*) Do you sell that smelting coal unscreened?—No, it is through and through.

2332. There is no small taken out?—No.

2333. You take care that you have nothing but the 4-feet and the 6-feet?—We will not take any coal from Swansea but the 4-feet and the 6-feet.

2334. Is the same care observed by other shippers as well as yourselves as to that?—There has been no care taken lately. When the demand for coal was so great people had to take what they could get, and I think that has been the cause of so many ships taking fire lately.

2335. You attribute the large percentage of cases of spontaneous combustion of late years first to the carelessness of the workmen in not cleaning the coals, and secondly, to the promiscuous mixing of the 4-feet, and 6 feet, and the 5-feet?—Yes.

2336. And I suppose you would say that the masters are culpable as well as the men in not taking care that the coal is wrought clean?—No doubt the masters ought not to have shipped coal from those veins where the coal was liable to ignite spontaneously.

2337. Have you considered whether it would be practicable to carry out the suggestion you have made of having the coal shipped in compartments?—I think it could be carried out.

2338. Take a 1,500 ton ship; how many compartments would you have?—900 tons would be the utmost that a ship would carry going to the west coast of South America.

2339. You are speaking of the west coast of South America trade?—Yes.

2340. What is your idea of the size of the compartments that would ensure more security?—I should think in a space the size of this room I would have four or five compartments.

2341. That is to say you would have quantities of 200 or 300 tons together?—Yes, I would put planks between the coal as it was put in.

2342. Supposing you had one or two partitions in a space the size of this room, would not the pressure be the same as you have now?—There would be a separation of the pressure just the same as in the case

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of a rick of hay. You may make a rick of hay into two or three compartments, but if you make a large rick, and if the hay is not good, it is sure to take fire; whereas if you have a small rick it is not so liable to ignite spontaneously.

2343. Shipping by boxes you would limit to merely filling the hatches with them; it is not practicable to adopt that system on a large scale where great despatch is needed is it?—For large coal I would not care to do it but it would pay the coal buyer to have it done that way because there is a great deal of breakage in dropping coal down 20 feet.

2344. Ventilation you do not attach much importance to except as a safeguard against explosion?—I would not object to it; I would prefer to ventilate the ship, though there is a difference of opinion about it; provided there was a large hole made in the cargo it would be a good thing.

2345. You have been a shipowner and sending coals to the west coast of South America for a long time?—Yes.

2346. How long is it since you arrived at the conclusion that the 4-feet and the 6-feet were the only two safe seams from which to ship coal?—It is notorious everywhere in the district of Swansea.

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2347. That must have been the result of experience from other coals having been found unfit for a long voyage?—Several coals have taken fire when people have been speculating on coal from other seams. There is the Avon Vale, that is known to have taken fire. I would not ship a cargo of it. They shipped one or two cargoes, and they took fire, and I told them they would be sure to get them on fire.

2348. With regard to the Rhondda coal, there is a large quantity of Nos. 1, 2, and 3 shipped, you said that in your opinion all coal from those veins must fire?—That is from what I have heard, it is a good coal for cokeing and house purposes, but I do not think it would go on a long voyage if shipped through and through.

2349. (*Mr. Duncan.*) From what you have suggested in reference to separating coals into different parcels, I gather that you would consider it better to have a coal-carrying vessel built with two or three decks rather than having 24 feet depth of hold, the whole of the cargo lying on one bottom?—Yes, that would be as good as anything; 24 feet is too great a depth unless the coal is very clean and dry. I think what you suggest would be a very good arrangement.

The witness withdrew.

Captain JOHN GALLOWAY examined.

Captain J. Galloway.

2350. (*Chairman.*) You have been master of different merchant ships for some time?—Yes; for about 20 years.

2351. And you have had some experience in carrying coal?—Yes, I have been carrying coals 16 years in the Indian trade.

2352. Have you had any experience of cases of spontaneous combustion or explosion in coal-laden ships?—I have very little experience in that respect, it has only been in the last six or seven years that I have even seen any signs of heating.

2353. Within the last six or seven years have cases of heating come under your observation?—Yes.

2354. I think you had one very serious case in a ship you commanded?—Yes, the "Malabar."

2355. Is that the only ship you commanded in which such a casualty ever took place?—Yes.

2356. In what year was that?—In 1870.

2357. What coal was it?—It was fron Langley Mill coal-pit. We shipped it in London.

2358. You sailed from the port of London with that coal?—Yes.

2359. Do you know in what part of the country Langley Mill pit is?—I do not know. The coal was shipped from lighters which came alongside.

2360. You do not know whether it was north country coal?—No.

2361. Your ship was an iron ship?—Yes.

2362. Of 1,200 tons register?—Yes.

2363. And you carried under 1,300 tons of coal?—We had 1,274 tons on board.

2364. How many days were you out when the casualty happened?—About 36 days.

2365. Where were you bound for?—London to Batavia.

2366. Can you tell us anything about the circumstances of the casualty?—After having been out about 36 days, on one Saturday night, for about the first time all the while that we had been out, the hatches were put on. We generally had the hatches off in good weather all the way, but I told the mates that night to secure the hatches as I expected a change of weather, so they put the hatches on; and on Sunday morning about 5 o'clock the second mate took off the hatches, and he came and called me and told me that there was smoke coming up through the centre of the coals in the main hatchway. When I saw that, I altered the ship's course and put back for Rio Janeiro, and threw 50 tons overboard, and when I had put that 50 tons overboard the flames burst all over us. We set the pumps to work all that night and all the next day. We had two force-pumps and a little donkey engine, and we put the hose through under the 'tween decks; the 'tween decks were all burning, till at last the flames got halfway up the mainmast. Then we were obliged to close up the hatchways, and to put sails on the top of the hatches, and chains on the top of the sails to keep all close. That went on for two days, during which time I had the crew put in the stern. An American ship came up, and the crew said they would not stop any longer; they said that the flames might burst up at any moment. I wished them to stay that night, but they would not, so we went on board the American ship, and in about an hour after the hatchways blew right up and the mainmast went over the side.

2367. The ship was a total loss?—Yes.

2368. Do you know in what state that coal was taken on board?—I was informed afterwards by my mates that the coals were taken on board wet; that the lighters had been making water, and the coals were in a wet condition.

2369. How were they shipped from the lighters?—By baskets.

2370. Without any great fall?—They had no fall at all.

2371. Do you attribute the heating of that coal to its being shipped damp?—Yes, that is what I attribute it to.

2372. You do not know whether that particular description of coal was peculiarly combustible?—No. It was small bad coal that they were shipping at first, and I called the attention of my owner to the fact then; he made some remonstrance, and they seemed to be better after that.

2373. When you say they were bad you mean they were of inferior quality?—They were small.

2374. You had not it in your mind at the time that they were dangerous?—No.

2375. How was your ship ventilated?—Right along the keelson fore and aft, and then up and down the three hatchways.

2376. What was the size of the ventilating passage or chamber along the keelson?—About 18 inches square.

2377. Was it on both sides of the keelson?—It was put over the keelson on the keelson itself.

2378. Is that the only case you have personal knowledge of?—The only one. I have loaded coals since. I loaded coal in Dundee in another ship, and while they were loading it came on very wet and I stopped loading for two and a half days, I would not allow the coals to go in at the time it was raining.

2379. And you had no trouble in the case of that cargo?—No.

2380. You have had an experience of 20 years as master of a ship?—Yes, I have been taking coals out to the East Indies 16 or 17 years.

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2381. During all that experience the case you have mentioned is the only case of spontaneous ignition that you have had?—Yes.

2382. What is your impression about ventilators, do you fancy it does any good?—I fancy it does a great deal of good. In the case of the "Malabar" the ventilators were partly smashed when the coal was taken in. I cleaned the fore and aft ventilators, but the main one was not properly cleaned, or we would have observed the fire sooner.

2383. You are not one of those who look on ventilation as useless?—No, I think it is very much required. I would put a platform underneath if I had my will in any ship taking coals on board, about 2 feet above the ceiling with holes in it, so that there might be a current of air underneath.

2384. In your 20 years' experience have you had to do with all kinds of coals?—Yes, but they have been mostly Scotch coals shipped on the Clyde. I have taken them from Wales, but only to the West Indies and Mauritius, when they have been about two or three months on board.

2385. Notwithstanding they were all that time on board you did not find that they became heated?—No.

2386. (*Sir George Elliot.*) You say you have been engaged for 16 or 17 years in carrying coals. For how many years have you adopted any system of ventilation in your ships?—They never were ventilated till about 1867 I think.

2387. For about 8 or 10 years you were navigating vessels without ventilation?—Yes.

2388. And you never had any casualty of any kind?—No.

2389. Seeing that you went 8 or 10 years without any mishap, would not that lead one to infer that there was no necessity for ventilation?—My opinion is that the cause of that unanimity from danger in former times was that the coals were put in bins, that is to say, large places at the coal pit, and they would lie perhaps 12 months exposed to the air before they were put on board ship, but now they take them out of the coal pits and put them on board ship directly, so that the gas does not have time to escape. The class of ships now conveying coal have been generally much increased in tonnage, consequently greater masses are carried in one bulk, formerly 500 to 1,000 tons may be taken as the extremes generally of foreign cargoes: they now range from 1,200 to 2,500 tons cargoes, and consequently require more care and ventilation through the greater mass of the cargoes.

2390. You mean that up to 1867 you used to take the coal on board your ship out of stock and not out of the pit?—Yes.

2391. That would only be during a portion of the year; you would not always be taking out of stock, would you?—I expect they were mostly taken out of stock in those days; they used to be in great heaps, and where those coals were lying any length of time exposed to the air the gas would escape.

2392. Did you ever know any Scotch coal to take fire by spontaneous heating?—Yes; several of those ships that left Dundee with me last year caught fire.

2393. I mean previous to 1867 when the system of ventilation was not known?—There was one in 1868, the "Duke of Portland" took fire; she loaded in Ardrossan, and the crew came into the Mauritius when I was there.

2394. Was she ventilated?—No. That was the first one carrying Scotch coal that I remember.

2395. During the first 8 or 10 years of your experience you never ventilated?—No.

2396. And you never had anything happen to you?—No.

2397. Is that a condition that can be much improved on do you think?—I do not know whether the different quality of coal may have anything to do with it, yet the greater bulk of the cargoes has I believe much to do with it.

2398. As to the "Malabar," which did take fire, the men lifted the coals by baskets from the barges and put them into the ship?—Yes.

2399. When the men lifted them up to the hatchways did they drop them down?—They capsized them down.

2400. Therefore they would fall 18 or 20 feet?—They would at the commencement.

2401. And they were wet you say?—Yes, the mate told me that the lighters were making a great deal of water.

2402. (*Chairman.*) Have you any general suggestion to make to the Commission on the subject of their inquiry?—No.

2403. (*Mr. Duncan.*) With regard to the coals shipped in the "Malabar," you do not know from what district of county they came?—No.

2404. What dock was she in when she loaded those coals?—The Victoria dock.

2405. The coals did not come to the ship in trucks?—No, in lighters.

2406. Do you know where the lighters loaded?—No.

2407. Do you think they loaded close by the Victoria dock, just outside?—I could not say where they loaded.

2408. (*Mr. Young.*) You have no personal knowledge of any cases of burning except this one?—No.

2409. And you have carried a great many cargoes of coal?—Yes.

2410. Mostly Scotch coal?—Yes.

2411. Both from Glasgow and Dundee?—On the first voyage I went with the "Malabar" I wished to get the ship ventilated. My owners said, "No, it was of no use to ventilate Scotch coal," I said I thought it was useful, so I got them to adopt the system of ventilation; it was on my third voyage bound to Batavia in her that this casualty happened. I went out and came back all right on the two first voyages, and I was taking a cargo of coals out on the third voyage when the fire took place.

2412. (*Mr. Icely.*) Speaking of your system of ventilation you described a trunk running along fore and aft near the keelson, was there any communication with the deck from the trunk?—Yes, the up-and-down ventilators went into the horizontal trunk. The ventilators went down fore and aft.

2413. So that there were two currents of air, one coming to the foremost part of the ventilating trunk and the other to the after part?—The horizontal ventilator went right fore and aft along the keelson; and then there were ventilators up and down in the three hatchways which went into this fore and aft ventilator.

2414. Those upright ventilators were uptakes for the gas?—Yes.

2415. You had an in draught at the after part of that trunk that was laid horizontally and you had an in draught at the fore part?—Yes.

2416. And those perpendicular or vertical trunks were the exits for the foul air?—Yes.

2417. (*Mr. Fenwick.*) You said you were 36 days out when you first discovered indications of heat?—Yes.

2418. Whereabouts were you then?—In 29° south and 30° west.

2419. You say you had your hatches off most part of the time?—Yes, till that night.

2420. You had ordered the hatches to be put on that night on account of the changeable weather?—Yes, when you come outside 30° south you may expect gales of wind.

2421. (*Mr. Cory.*) Those particular coals which were shipped in the "Malabar" could not have been very fresh from the colliery, could they?—I could not say.

2422. You loaded in London?—Yes.

2423. There are no collieries in the immediate neighbourhood of London?—No.

2424. The coal must have come some distance?—Yes.

2425. It must have been shipped into the lighters in London?—Yes.

2426. Therefore it could not have been very fresh

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from the colliery?—I have no information as to how long it was out of the coal pits, but it was taken on board in a wet condition.

2427. Those coals must have come some distance, while many of the other cargoes which you have carried safely would probably have come very quickly from the colliery?—They may have come quickly from the colliery, but they would have been put out in bins at the colliery and exposed to the air a long time before shipment.

2428. You look upon that exposure of the coal to the air at the colliery before shipment as an element of safety?—Yes.

2429. Have you any reason for coming to that conclusion?—There are so many coal ships that take fire nowadays when they do not keep the coal in bins at the collieries as they used to do before being shipped that I come to that conclusion; that is the only thing I go by.

2430. (*Chairman.*) You do not draw your conclusion from the case of the "Malabar," but from general observation?—Yes.

The witness withdrew.

Captain James Cawkitt examined.

2430*a*. (*Chairman.*) You are manager of the Salvage Association at Liverpool?—I am.

2431. And chief surveyor to the local underwriters?—Yes.

2432. How long have you held that position?—About 12 years.

2433. Previous to that you had been master of a ship in the East Indian trade?—In the East Indian trade, the China trade, and the Australian trade.

2434. In both capacities you have had some experience in connection with the shipment of coal?—My experience with regard to the shipment of coal since I left the sea has been chiefly confined to Liverpool and Birkenhead, but I have heard a great deal about the shipment of coal from other parts from time to time.

2435. You have studied the question from information that has reached you more than from your actual personal experience?—That is so.

2436. Have you arrived at any opinion with respect to the greater or less liability of particular kinds of coal to ignite spontaneously on board ship?—More particularly of late we have found that the number of cases of burnings has increased chiefly in the Lancashire coal, smelting coal going out to the west coast of South America.

2437. At Birkenhead you ship exclusively North Wales and Lancashire coal?—Yes.

2438. You do not ship any Derbyshire coal there?—No.

2439. Nor any Staffordshire?—There may be some, but it is chiefly North Wales and Lancashire.

2440. Have you noticed any increase in the casualties in the shipments of North Wales coal of late years?—Not so much of late years.

2441. But you have observed a considerable increase in the casualties in the Lancashire coal?—Yes.

2442. Could you describe to the Commission the particular seams or the particular denominations of coal which appear to you to be more liable to spontaneous combustion than others?—I do not think I could give you the seams. I think they have been chiefly Barnes' shipments of Lancashire coal and one or two others, which Mr. Rundell gives in his list. I could not tell you the particular seams or the pits. I can only say, speaking of shipments of Lancashire coal generally, that we have noticed that there have been more fires in them of late than in others.

2443. Do not the underwriters endeavour to trace home the particular description of coal in which the greatest risks seem to occur?—Yes.

2444. Have they not succeeded in that?—They have the statistics which Mr. Rundell has embodied in his pamphlet; many of his statistics are got up from our surveyors' reports, and they are recorded in the pamphlet which he has published.

2445. All you are able to say is that in coal raised from certain districts in Lancashire the risk seems to be much greater than it used to be?—Yes.

2446. How would you describe those districts?—I should call them the Lancashire coal districts.

2447. Is the result of that that the premiums charged by the underwriters on the shipment of Lancashire coal has risen?—Not alone on Lancashire coal.

2448. Is it higher than it was on Lancashire coal?—Yes.

2449. Much higher?—Yes.

2450. Have you been able to arrive at any opinion as to what the cause of the increased liability to fire may be?—My own opinion is that a great deal of it is attributable to the shortness of time that elapses between the time of the coal being wrought from the pits and its going into the ships, and perhaps from an inferior kind of coal being shipped.

2451. The shortness of time would cause the coal to be more gaseous?—The air would not have the same opportunity of percolating through it and permitting the gases to escape before the coal was put into the ship's hold?—No.

2452. That would point rather to explosion than to heating and spontaneous combustion?—This coal is of an explosive character. I do not profess to have a thorough scientific knowledge of coal; but the impression upon my mind is that the more coal is liable to spontaneous combustion the less it is liable to explosion, and the more liable it is to explosion the less liable it is to spontaneous combustion. I am not positively certain that that is so.

2453. Is it your judgment that it is rather in the direction of heating than in the direction of explosion that the recent increase of accidents has taken place?—I think so. In the whole of my experience I have only had one case of explosion, and that occurred at Birkenhead about six years ago. That was in the case of a vessel called the "Mary Amelia," which loaded South Wales steam coal from the Dyffryn steam colliery. Our surveyor had a note that she had loaded a cargo of South Wales coal. There was no ventilation. They closed the hatches on the Saturday, and on the Monday we heard that an explosion had taken place at Birkenhead, and it turned out that it was in this vessel. It appears that the hatches having been closed from Saturday night, the ship keeper went on board on the Monday morning, and went into the store-room with a naked light, and the whole deck blew off. The man was badly injured, and a paper was found in his pocket warning him against the explosive character of this coal, and telling him not to take a naked light down below. That has been the only case of explosion in the neighbourhood of Liverpool that has occurred in my experience.

2454. With reference to heating and spontaneous combustion, have you formed any opinion as to the desirability or otherwise of ventilation?—I am strongly in favour of ventilation, that is to say, ventilation carried out thoroughly and carefully.

2455. Will you describe what system of ventilation you would recommend?—If we could ventilate the whole cargo in a body, so as to admit air through the whole of it, I do not think spontaneous combustion could arise, but perhaps it might be impossible to devise any system of ventilation to do that.

2456. Even though the coal should be small and wet?—I should think if the coal was shipped damp, and it was small coal and in a confined space, firedamp must follow. That would be a very dangerous state of things I think.

2457. In any case you would be for the greatest amount of ventilation possible?—Yes; as a prevention.

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2458. What exact process of ventilation would you recommend?—What I should recommend in the first place would be a platform perforated with small holes, laid under the cargo, so as to raise the cargo and allow a current of air underneath it, and then ventilating shafts up each hatchway, communicating for and aft with the top of this platform.

2459. How high should the platform be above the keelson?—In a wooden ship it need not be as high as the keelson, but I should say it might be about 18 inches from the ceiling to the top of the platform.

2460. Carried the whole way fore and aft?—Yes; as far as the coals were carried. Those ventilators should be carried up above the deck with those bell-mouthed tubes upon them, so that they could be turned to the wind to enable a current of air to go down under the platform.

2461. Irrespective of ventilation, have you any suggestion to make with regard to precautions which are now not taken, and which you think ought to be taken?—The great point is the shipping of the coal in a good dry condition, and every care being taken that air is admitted into the hold by every possible means. I think it is a most important point that the coal should be shipped dry.

2462. (*Sir George Elliot.*) How long have you had the superintendence of the shipment of coals at Liverpool and Birkenhead?—I have not the special superintendence of the shipment of coal more than any other cargoes, but in the course of our duties we note how coal ships are loaded for the information of the underwriters.

2463. You are employed by the underwriters?—I am chief surveyor to the Liverpool underwriters, but we are daily in communication with gentlemen who superintend specially the loading of coal for the Peninsular and Oriental Company, the East Indian railways, and so on.

2464. How long have you held that office?—12 or 14 years.

2465. I suppose in your experience there has been a much larger number of cases of fire in coal-laden ships these last two or three years than there had been previously?—There can be no question about that.

2466. Has there been less ventilation the last two or three years?—I think the ventilation has been about similar.

2467. It is not due to any change in respect of ventilation?—No.

2468. What strikes you as the reason for these increased number of casualties?—As I said before, I think the shipment of small coal has a great deal to do with it. It has not been allowed to accumulate at the pits, and then it goes fresh from the pits to the ship. Of late that has been particularly so in consequence of labour strikes, and so forth, and in consequence also of the great demand for coal, and the small quantity ready to ship. That has been particularly so with regard to this smelting coal. I think very inferior qualities and small coal have been shipped.

2469. Have the coals been shipped with more despatch the last two or three years than previous to the last two or three years?—I think they have.

2470. What makes you think so?—Perhaps last year they were not so quickly shipped, but before that there was a very great demand.

2471. Was there not a great difficulty to get coals last year?—Last year there was.

2472. And consequently were not they shipped more rapidly?—The individual ships that loaded would receive the cargoes more rapidly; there were a great number of ships waiting for coal at the time.

2473. Are you aware that no more coal was raised in 1873 and 1874 than previously?—I am not aware of that.

2474. You regard the rapidity with which, during the last two or three years, coals were brought from the pit to the ship as compared with previous times, as one of the causes of the increased number of casualties?—Yes.

2475. Another cause in your opinion is that the coal has been smaller than it was three or four years ago?—I think the Lancashire coal has been smaller.

2476. There has been no change in the ventilation?—No, I think not. We believe in ventilation, and we have tried to get it carried out to the greatest extent of our recommendations.

2477. You said that Barnes' coal was more especially liable to take fire spontaneously?—He is one of the shippers to the West Coast. Several of his ships have been burnt with that description of coal in them.

2478. That is from Lancashire?—Yes.

2479. You cannot specify any particular district?—No; I do not know what mines they came from.

2480. (*Mr. Duncan.*) Did you carry coals yourself when you commanded a ship?—No.

2481. How many years back does your experience go in conexion with the shipping of coals?—12 or 14 years.

2482. Do you think there was as much ventilation 12 or 14 years ago as there is now?—No; I think there is more ventilation now.

2483. Seeing that there is more ventilation now than formerly, might not it be that ventilation does harm rather than good; has that ever occurred to you?—No; I think the number of long voyage coal ships to the east has been increasing of late, and that would account for an increased number of casualties.

2484. If you were told that scientific men who have analysed coals have found that they contain sulphur and pyrites and have ascertained that by allowing a current of air to pass over those constituents the oxygen of the air very likely tend to set the coal on fire, you would probably question the desirability of passing great quantities of air over coal when carried on board ship?—If a fire took place no doubt ventilation would tend to aggravate it, but as a preventitive we believe in ventilation, and further we think that it leads to other precautionary measures. I do not think sufficient care is taken by the captains and officers of ships that load coal. I think they are too careless about it. They do not take the danger of the cargo they are taking on board fully into consideration.

2485. In what way?—I mean in taking precautions. For instance, there are very few coal ships that go away with a thermometer to test the temperature of the coal.

2486. That would not prevent the firing of the coal?—No; but it might forewarn them of danger.

2487. You mean by their not taking care they are not careful to keep their hatchways covered in rainy weather and things of that sort?—I think the principal precautions are required when they are loading the cargo and they ought to be continued throughout the voyage.

2488. It has been stated before this Commission that there are cases where the admission of air would positively tend to put the coals on fire; that allowing a current of air to pass through them would supply to the pyrites contained in the coals the very thing to create spontaneous combustion; has that ever occurred to you?—That has occurred to me; but that is a question for scientific men to deal with.

2489. Further than your own practical experience you have no data upon which to ground your judgment in reference to ventilation being very desirable?—No.

2490. You probably consider that coals emit gases, which gases are inflammable, and that it is therefore desirable to get them out of the ship as quickly as possible. Is that the principle on which you think ventilation is desirable?—The principle on which I think ventilation desirable is that it is desirable to get a current of air through the coal; gas usually accumulates on the upper surface; if the gas accumulates on the upper surface that is a different condition of things to spontaneous combustion; that occurs from firedamp in the ship hold.

2491. (*Mr. Abel.*) You state that coals in which explosions were likely to occur would be less liable to

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spontaneous combustion than other coals; have you any facts to support that opinion?—No; it is merely my own opinion and the result of conversation with others. There have been very few cases of spontaneous combustion in shipments of coal from South Wales ports where they ship steam coal of the best character.

2492. Is that coal liable to explosion on board ship?—Yes; I believe the south Wales coal is.

2493. That is only an opinion?—It is only my own opinion.

2494. You also stated that coal coming fresh from the pits was more liable to spontaneous heating than coal which had been exposed, and you thought that the increase in the number of casualties was partly due to that. Is that based upon any facts that you can give the Commission?—That is only a general opinion I have formed.

2495. You also stated that small coal had been allowed to accumulate at the pits and that this had been shipped fresh from the pits to the ships, and you thought that that was one cause of the spontaneous heating. I do not quite understand that?—The small coal would be more liable to generate heat and damp than large coal. Large coal stowed in the vessel's hold would admit air amongst it.

2496. What you really meant was, that the increased number of casualties might be due to shipping a larger proportion of small coal which had been allowed to accumulate. If that small coal was damp it would be more liable to spontaneous heating?—Yes.

2497. You ascribe the increased number of casualties rather to the larger proportion of small coal shipped than to the shipping of it fresh from the pit?—I think it is due to both causes.

2498. Have any facts come within your knowledge which have led you to that conclusion, or is it merely an opinion?—Most of the burnings in the ships we have heard of have been under the main hatch, and the bulk of the burnings have been in vessels that have been loaded under the tips where the coal is broken, and where there has been a lot of small coal accumulating round the main hatchway, and I believe in most instances the fire has been proved to have originated about the main hatchway.

2499. Those casualties have, in your opinion, been caused by the production of small coal by the method of shipping, and not by the shipping of a larger proportion of small coal as such?—That is so to a certain extent, but the action of damp in the case of small coal would be more injurious than in the case of large coal in a confined space.

2500. (*Mr. Young.*) You are practically employed as professional assessor to the underwriters at Liverpool, and you go round to look at the ships for the purpose of seeing that the ships are in good order, and that the cargoes are properly loaded?—Our staff of surveyors do, and I used to do so till lately. I am more in the office now.

2501. Coals of course only come along with other things under your observation?—Yes.

2502. You have not paid any particular attention to coal cargoes?—Yes, as regards ventilation, storage, quality, and quantity shipped by each vessel.

2503. Has your experience led you to warn underwriters against certain classes of coal as being liable to spontaneous ignition when shipped on board vessels?—All that we have been in the habit of doing till lately has been to report that a vessel is loading with a cargo of North Wales coal, South Wales coal, or Lancashire coal, and whether by hand or by tips, without reference to the colliery; but of late, since these burnings have been so frequent, we have been taking notice of the colliery from which the coals have come.

2504. Have you found a marked increase in the number of cases of spontaneous combustion in shipments of coal from Birkenhead within the last two years?—There was a great immunity from fire in coal shipped at Birkenhead till about three years ago. We had scarcely a case of spontaneous combustion in shipments from Birkenhead till three years ago.

2505. Has there been a great increase also in the number of such cases in ships that have gone from Liverpool?—Yes.

2506. Has the increase been greater than in the case of Birkenhead?—Yes.

2507. Your advice to the underwriters would be to avoid insuring ships shipping coal from such and such collieries?—They would notice the facts given in our reports and act upon them.

2508. Has it come within your observation that the class of ships that carry coals from either of those two places has deteriorated during the last few years?—We think they have rather improved.

2509. They are mostly iron ships?—Yes, and large fine American ships.

2510. You do not find so many old-fashioned colonial-built vessels of a low class?—No, not so many.

2511. Do you find that ship owners as a general rule take great pains in the way of seeing how the coals are shipped themselves?—Yes.

2512. Irrespective of you and your surveyors?—I think so. I think every disposition is shown to carry out the recommendations of the surveyors.

2513. They make you welcome on board?—Yes.

2514. (*Mr. Icely.*) Is it one of your requirements that the temperature of the cargo should be taken?—Our surveyors who visit the ship ask the captain before the vessel loads what mode of ventilation is adopted, what coal he is taking, the quantity, and so forth. One of the questions we put is whether he is taking a thermometer with him to test the temperature, if he says, No, we recommend him to do so, and we advise his recording the temperature in the log book each day.

2515. Has it been your custom to ask those questions and to make those recommendations for a long period or a short one?—It has been our custom for several years back. We cannot insist upon their doing what we recommend. We merely advise and suggest.

2516. Within your experience for how long a period has it been considered necessary to ventilate ships?—I think they have been ventilated now as far back as I can recollect, but the mode of ventilation I think has been rather improved.

2517. A system of ventilation of some sort or other has been adopted for a great number of years?—Yes, I think so.

2518. (*Mr. Fenwick.*) You are decidedly in favour of ventilation yourself, and the Underwriters' Association at Liverpool adopt your views in regard to ventilation?—Our mode of ventilation has been adopted by them, and it is understood that most of the ships which they insure are ventilated in that way.

2519. (*Chairman.*) Was coal treated as a specially hazardous cargo till lately?—Formerly I do not think it was.

2520. Was the premium on ships carrying coal higher than upon ships carrying iron?—No.

2521. Now it is very much higher?—Yes.

2522. That is the result of the impression produced on the minds of the underwriters by the casualties in the last few years?—Yes.

2523. Is there any difference in the premium charged on ships going from Liverpool with Lancashire coal and that charged on ships going from Birkenhead with North Wales coal?—No. I think the premiums are generally equal; they have all risen.

2524. Though the risk may really be very different?—Yes.

2525. There is a sort of panic among the underwriters just at present?—There is, in consequence of the frequent burnings of late.

2526. Are the underwriters kept fully informed of all facts tending to show the comparative liability of different descriptions of coal to take fire spontaneously?—The underwriters have Mr. Rundell's statistics before them, and they are guided by those facts in taking risks. We state that a vessel is loading

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a cargo of Lancashire coal, and we may state the colliery from which the coal comes. The underwriters are now thoroughly posted in the character of the coal from the different collieries. Mr. Rundell's statistics give the number of burnings, and also the mine that the coal comes from, and the underwriters are posted up in those facts accordingly.

2527. I gather that you merely report what coal it is that is being shipped, and then the underwriters have Mr. Rundell's statistics before them, by which they are guided in fixing the premium they charge according to the denomination of the coal?—That is so. I believe the premiums are equal all over. I do not think there is any great difference between the premium in the case of one coal and another.

2528. If the premiums are equal all over, and if it has come out before us that there is a very remarkable distinction in the liability to ignition spontaneously between different kinds of coal, one would infer that the underwriters are imperfectly informed with regard to the various characters of the different descriptions of coal?—I do not think that. I think each underwriter will take his own view. I could not speak with regard to the premiums. I think the underwriters as a body are fully informed as to the dangerous qualities of particular descriptions of coal. Each underwriter, I presume, will act on his own judgment.

2529. (*Mr. Young.*) You say the premiums remain very much the same. Is not it the case that Liverpool underwriters do not underwrite such cargoes as you, from your reports, show to be dangerous, and that those cargoes are not taken in Liverpool at all?—That rests with themselves. We merely report the facts for them to act on at their pleasure.

2530. They judge of them themselves?—Yes.

2531–2. I believe that practically they refuse to underwrite risks that you report unfavourably on?—Yes, I should think so; some might and some might not.

The witness withdrew.

Captain WILLIAM KENNEDY examined.

Captain W. Kennedy.

2533. (*Chairman.*) You have commanded ships in the merchant service for some years?—Yes.

2534. You have had considerable experience in carrying coal?—Yes, a good deal.

2535. About how many voyages have you made with coal?—10 voyages.

2536. Within how many years?—18 years.

2537. Have you ever had a case of spontaneous combustion in any of your ships?—Once.

2538. Will you tell us the particulars of that case?—My first voyage with coal was in a ship of 1,100 tons, called the "Wallace." I loaded her with coals in Cardiff at the beginning of March 1852 for California. We had to call at Callao for orders, and then we went to San Francisco. The coal was on board for about seven months from the time we loaded till we began to discharge, and though we had no ventilation there were no signs of heating in the ship during the voyage. On the next voyage, in the same ship, I loaded in London, out of barges, and went to Coquimbo, and arrived all safe. On that voyage also she was not ventilated. Then I went out twice with coal to Hong Kong in another ship, a ship called the "India," and she went safe.

2539. Was she ventilated?—No. The "India" loaded coals in the Clyde, and went to Hong Kong all safe. She was not ventilated, she was only a 550 tons ship; on both voyages there were no signs of heat at all. I next went out in the "L'Aqouhanna." On her first three voyages we were ventilated, only we had no ventilation along the keelson. It was the stevedore's idea that the large coal might be laid in a rough way fore-and-aft along the keelson and above the keelson about two feet. He did that himself, and when the coal was about 8 feet high we had two ventilators right fore and aft, about 15 inches square, and we had uprights in the fore hatch, the main hatch, and the after hatch; then we had cross ventilators from those into the uprights, and the ends of those fore and aft ventilators were clear from the coal; they were away 2 or 3 feet from the coal. That was the system adopted for three voyages. The coals, in the case of those three voyages, were loaded in Birkenhead by barrow, the barrow was tipped wherever it was required without any fall at all; and then when they came to get within 4 feet from the beams, and they could not work under the beams, they laid a plank on the top of the beams and wheeled the barrows along that way, and then there was only a 4-feet drop. On the last voyage the agent and part owner was in a great hurry, and he would have us go under the tip in Birkenhead. The tip lifts a truck about 15 or 20 feet above the ship's deck, the coal runs in an iron shoot, and by the time it gets into the hold it is smashed up very much, and a large body of small coal always lies where it falls, for the trimmers never think of trimming that, it is only the round coal that they trim. When I saw this I objected to it, and I said "I do not like this small coal accumulating here, and we ought to be careful now that we hear of so many ships taking fire." The agent said "Do you think the ship will be lost through it?" I said "I would not go so far as to say that, but still I did not like it." We had an extra ventilator alongside the keelson. We had pieces of wood in this way ∧ on each side of the keelson, the lower board was about 3 inches off the skin. Then there would be a ventilator down each hatchway entering into the fore and aft ventilator in the ship's bottom. On this voyage, on account of so much small coal that went in with the tip, I had two tiers of ventilators, one under the beams, and another tier above the beams, there being ventilators into the uprights in each hatch from each of those tiers of ventilators. I could not say exactly the date we left Liverpool, I think it was the 10th or the 15th of October that we left. We found no heat till we got within 500 miles of Bombay. The first indication we had of the heat was seeing the paint beginning to get black, and there was a smell as if coal-tar had been capsized, though there was no such thing in the ship at all. We got the fire hose to work and threw in water, and pulled to in the best way we could. After we had got 2 feet of water in the ship, we got the hose attached to the main pumps and pumped the water out, and then put water down the hold again so as to saturate the coal, but it was all of no avail. After about 50 hours of it we were at last obliged to put the boats out, at about 4 in the morning. We got them victualled and watered, and by the time they were ready it was time to go out.

2540. The ship was a total loss?—Yes. We were not a mile away from her when the flames burst up the after hatch and the main hatch, and 10 minutes after the mainmast fell carrying with it the mizenmast.

2541. What coal was that?—I could not say. Our agents could tell probably. It was called North Wales coal.

2542. Considering your immunity from accidents of this kind in your previous voyages, to what do you attribute the casualty which you met with on that occasion?—To the coal being dropped down from such a height and its being smashed up so that there was so much small coal lying under the main hatchway.

2543. The accumulation of so much small coal produced an unfavourable impression on your mind at the time; you did not expect to lose your ship, but still you thought it was dangerous for the small coal to be lying there in such a mass?—Yes.

2544. Do you think that the thorough ventilation which you seem to have exceptionally given to this ship increased the danger, or do you think that it diminished it?—When the fire did take place it was worse; it acted as a fan to blow it up.

2545. Do you think it tended to diminish the risk of taking fire originally?—I doubt it, because I have

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often carried coals without ventilation at all and no accident has happened with them.

2546. Do you take it to be the bent of your mind from experience that ventilation does more harm than good?—I do not think it does much good.

2547. What do your owners say about ventilation?—When I came home one of my owners, Mr. William Ross, of Glasgow, was quite astonished that I did not turn to and bore holes in the ship and let the water run into her in that way, and then pump it out. I said any person while the ship was burning could go down and bore holes, but after the water came to the fire we should get no one to go down to plug the hole.

2548. Do you know what the opinion of your owners is on the question of the ventilation of a coal ship?—My owners are of opinion that ventilation is beneficial.

2549. What are their instructions?—It is left to my own judgment. Messrs. Robert Young and Company, of Glasgow, were the principal owners of the ship, and they left it to me to do everything I thought was necessary with the advice of any older hands in the coal trade.

2550. Do you consider it to be the general opinion of those of your experience that in a trade like your own ventilation is beneficial?—There are a great many that I have known who have had their coal on fire, and whose ships were well ventilated, who have said that they did not think ventilation was of any use.

2551. They would push the hatches off as often as possible, so that any gas might escape?—We never had the hatches on except when it was raining. Salt water will not make the coal take fire; it is the fresh water that heats the coal.

2552. When you speak of ventilation, you mean ventilation through the coal?—Yes.

2553. You do not mean ventilation on the surface?—I believe it is of great benefit on the surface, because whatever gas there may be it will evaporate through the small openings in the coal.

2554. I take it to be the general effect of your evidence that you doubt the efficacy of ventilation?—I doubt the practical worth of ventilation at all. The last voyage I took with coals was in the "America" of Glasgow, 1440 tons register, built of iron. We sailed from the Clyde 11th April 1873 with 2000 tons of steam coal, and landed the same at Coconada, without any signs of heating during the whole voyage. No ventilators were used on this voyage; the owner, John H. Watt, Esq., did not approve of them.

2555. You are strongly of opinion that the lower the fall of the coal when it is put into the ship the better?—Certainly, you get the coal rounder.

2556. It is your opinion that a large accumulation of small coal in the ship's hold particularly under the hatchways is very dangerous?—Yes, because on one of my voyages when I got to Bombay there were four ships on fire, they had all got in in time to get assistance and they got the steam pumps from shore to put out the fire, and it was in the after part of the main hatchway that those ships were burning.

2557. Did they load under the tip?—Yes, those four ships were all from Birkenhead.

2558. (*Mr. Duncan.*) What was the name of those coals which you loaded on this voyage when they took fire?—I cannot say. They were North Wales steam coal.

2559. Were they as round coals, generally speaking, as you had been accustomed to load from Birkenhead?—Something the same.

2560. As a rule the coals from Birkenhead are large coals?—Yes, some of them are very large.

2561. This cargo was not quite so large?—No, and the coals being so small and having to fall a great height there was a great accumulation of small coal round the hatchways.

2562. Do you think it possible that the coals might have come from East Cheshire and come round to Birkenhead to be shipped?—They told me that they were North Wales coal.

2563. (*Mr. Young.*) Probably what you would do in future would be to adopt the plan you referred to as having been so successful on board one or two of your ships, that is to say putting the largest pieces of coal all along the keelson, and so creating an internal ventilation?—That is the way it was done for three voyages.

2564. And it was most successful?—Yes.

2565. You had no wooden ventilators at all in that case?—Not to the keelson; 7 feet above the keelson there were wooden ventilators right fore and aft.

2566. Probably you will continue to adopt that plan in future?—It was through the advice of older hands in the coal trade that I adopted it, and I may mention that I never found any heat at the bottom of those ventilators.

2567. Did you put the thermometer down from time to time?—Yes.

2568. Did you register the temperature in the log book?—Yes: the greatest heat I have ever felt in all the coal carrying in my experience has been just at the hatchway. You will always feel the heat there, but if you go down you will feel no heat.

2569. Do you mean that you will feel the heat whether the cargo is in a state of spontaneous combustion or not?—I have always experienced heat at the hatchway even when I have carried the cargo safely and well, and it is the same with a cotton ship. The heat has been so great at the hatchway that you would think the ship was on fire.

2570. It is not peculiar to coal?—No.

2571. (*Mr. Icely.*) Was this ship when she took fire ventilated in the same way as she had been when she went safely with her cargo?—She was better ventilated according to the opinion of older hands in the trade than myself; we had this roofing of wood over the keelson and about 10 inches above the keelson there was a free passage of 3 feet on each side of the keelson.

2572. Did the ends of that horizontal shaft extend beyond the coal on each side?—They could not go exactly beyond the coal because of the shape of the ship, but round knobs of coal were placed at the ends; I paid attention to that; all the large coal was placed round them.

2573. Where was the air admitted to that horizontal shaft?—From the main hatch and the fore hatch; upright ventilators went down into this shaft.

2574. Did the upright ventilators have a direct communication fore and aft with the shaft?—Yes.

2575. (*Mr. Cory.*) I understood you to say that you thought wet would tend to promote heat in a coal cargo?—Fresh water.

2576. But not salt water?—No.

2577. So that you would not close the hatches to prevent a little salt water going down?—No; unless there is heavy weather we never think of putting the hatches on. If I am not wrong I think the Peninsular and Oriental Company tried an experiment with salt water at Bombay; they got water carried up by the natives and they saturated the coal with salt water; they put no ventilators in the stock and there never was the least heat out of the coals at all, but they are very much afraid of their taking fire with fresh water, and I believe they have taken fire on shore at times.

2578. (*Chairman.*) Have you any suggestion to make to the Commission on the subject referred to them?—I only speak from what I know by experience. I may say that if cotton gets wet with salt water it will heat and be apt to set the ship on fire, but fresh water will not heat it. I was at Bombay when two ships were coming home with cotton bales; while they were loading the cotton was exposed to heavy rain; that did no harm, but afterwards when the cotton had got saturated with sea water both those ships took fire.

2579. (*Mr. Young.*) Was there any oil or seed on board either of those ships?—No; oil is a bad thing to have on board. I never allow a drop of oil below because there is nothing worse than oil.

The witness withdrew.

Adjourned.

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Tuesday, 16th November 1875.

THE RIGHT HON. HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

PRESENT:

FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
WILLIAM YOUNG, Esq.
J. M. CARMICHAEL, Esq., Secretary.

Mr. ARTHUR OWEN DAVIS examined.

Mr. A. O. Davis.

16 Nov. 1875.

2580. (*Chairman.*) You attend from the Peninsular and Oriental Company to give us what information the company have as regards spontaneous combustion of coal shipped for their service abroad?—Yes.

2581. Will you tell us in the first instance as to the year 1874, what were the total shipments of different kinds of coal?—In 1874 we shipped by 213 colliers 287,003 tons of coal to various foreign ports. To Alexandria we shipped 6,151 tons, which was carried by nine colliers. To Aden we shipped 60,755 tons by 36 colliers.

2582. Through the Canal?—No, round the Cape.

2583. (*Mr. Duncan.*) Those are coal-laden ships properly speaking?—Yes. To Brindisi we sent 28,862 tons by 27 ships; to Bombay we sent 38,164 tons by 24 ships; to Calcutta we shipped 6,794 tons by 4 ships; to Hong Kong we shipped 19,073 tons by 11 ships; to Malta we shipped 50,932 tons by 47 ships; to King George's Sound we shipped 15,096 tons by 8 ships; to Point de Galle we shipped 28,802 tons by 25 ships; to Shanghai we shipped 4,106 tons by 3 ships; to Singapore we shipped 18,834 tons by 13 ships; to Suez we shipped 4,217 tons by 3 ships.

2584. (*Chairman.*) Did those go through the Canal?—No, round the Cape for ports to the eastward of Suez. To Yokohama we shipped 5,217 tons by three ships.

2585. Can you give the class of coal in each case?—I have not the respective quantities of each description of coal in every case, but I can give the descriptions of coal conveyed to the principal ports. To Alexandria we shipped of Bebside West Hartley (that is Newcastle coal) 1,363 tons, and to the same port of Insole's Merthyr (which is a Cardiff coal) 2,301 tons. To Aden of Bebside we shipped 4,019 tons, of Howard's West Hartley 8,917 tons, of Battersby's North Wales Main 14,316 tons, of Scott's Brymbo (a North Wales coal) 14,937 tons, of Powell Duffryn (a Cardiff coal) 5,992 tons, of Insoles Merthyr 7,136 tons. Then to Brindisi we shipped 19,011 of Powell Duffryn and 6,474 of Buddles' West Hartley (a Newcastle coal); to Bombay we shipped 10,732 tons of Scott's Brymbo, 11,416 tons of Battersby's North Wales Main, and 3,785 tons of Insoles' Merthyr; to Calcutta we shipped 2,186 tons of Powell Duffryn and 1,804 tons of Insoles; to Hong Kong we shipped 3,261 tons of Battersby's North Wales Main, 3,146 tons of Scott's Brymbo, and 5,079 of Powell Duffryn; to Malta we shipped 33,044 tons of Powell Duffryn, and 2,927 tons of Davis's Maestag; to King George's Sound we shipped 5,895 tons of Battersby's, 3,750 tons of Powell Duffryn, and 3,846 tons of Scott's Brymbo; to Point de Galle we shipped 12,822 tons of Insoles' Merthyr, 3,657 tons of West Hartley Main, 4,243 tons of Howard's West Hartley, and 6,005 tons of Scott's Brymbo; to Shanghai we shipped 2,966 tons of Powell Duffryn, and 1,140 tons of Insoles' Merthyr; to Singapore we shipped 12,837 tons of Insoles' Merthyr, and 1,775 tons of Scott's Brymbo; to Suez we shipped 2,860 tons of Powell Duffryn, and 1,357 of West Hartley Main; to Yokohama we shipped 3,345 tons of Powell Duffryn, and 1,872 tons of Insoles' Merthyr.

2586. Will you tell us what casualties you have had, and with what class of coal in each case?—During the year there were three ships which loaded Howard's West Hartley (a Newcastle coal) for Aden. Those three were burnt.

2587. Have you the names of the ships?—The "Euxine" (an iron ship) the "Oliver Cromwell," and the "Calcutta." The "Euxine" had been a Peninsular and Oriental steamer, and after we sold her she was converted into a collier.

2588. (*Mr. Cory.*) At the time she was burnt she was a sailing ship?—Yes.

2589. (*Mr. Duncan.*) Can you tell us in what month of the year those vessels sailed?—The "Euxine" sailed on the 12th of June 1874. The "Oliver Cromwell" sailed on June the 18th, and the "Calcutta" on June the 12th. Then of the ships carrying coal to Bombay there is one missing, the "Nora Græme." She sailed from Liverpool.

2590. (*Chairman.*) In what month did she sail?—She sailed on the 23rd of September.

2591. (*Mr. Icely.*) Have you the description of coal she was laden with?—Scott's Brymbo.

2592. (*Mr. Duncan.*) You have no evidence that she was burnt?—No, we only know that she was lost; at least the underwriters have paid for a total loss. Then in the case of the ship "Ontario," which went with coals to Bombay; her coals took fire when she was just outside Bombay. The Government sent a tug out to bring her into the harbour and it was found that about 100 tons of her coal had been burnt or damaged. At all events we have claimed for 100 tons so damaged. The tug towed her into Bombay.

2593. (*Mr. Icely.*) When did she sail?—I cannot give you the date of her sailing.

(*Mr. Ferguson.*) She sailed on the 6th August 1874.

2594. (*Chairman.*) You may say there were four cases of actual combustion, and one of a ship missing, cause unknown?—Yes.

2595. Do you know anything about the state of the weather when the coal was shipped in any of those cases?—Generally more or less wet. It frequently happens that between the time when the coal leaves the pits and the time it is put on board some of it gets wet.

2596. Do you happen to know how the coal was put on board those ships, whether by tip or barrow? At Birkenhead the coal is invariably loaded by barrows into our colliers.

2597. (*Mr. Duncan.*) When the coal is being shipped have you any one representing you to see that no coal containing pyrites or shale is shipped?—Yes; we have an inspector at the ports of Newcastle, Birkenhead, and Cardiff.

2598. (*Chairman.*) Was the "Nora Græme" loaded at Birkenhead?—Yes.

2599. Where were the "Euxine," the "Oliver" "Cromwell," and the "Calcutta" loaded?—At Newcastle.

2600. How were they loaded?—I think they were loaded from tips, but I will not be certain. They were all loaded in the Northumberland Dock, and I believe from tips.

2601. Does the Peninsular and Oriental Company impose any conditions as to ventilation?—No.

2602. It is left to the shipowners to ventilate as they please?—The underwriters stipulate in some cases that the keelson shall be ventilated with vertical shafts or with Venetian ventilators to hatches.

2603. But in the tenders the company itself does not make any condition?—No; in fact our inspector at Newcastle, Captain Steinson, who has had a good many years experience, and is a thoroughly practical man, is quite against the system of ventilation from underneath.

2604. You have given us your statistics for the year 1874, have you any similar statistics for previous

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years?—I have drawn up a memorandum which I will read:—

"MEMORANDUM relative to spontaneous Combustion of Coal on Shore and in Bunkers of the Company's Steamers:

"Cases of spontaneous combustion in the company's coal stacks have taken place, but taking into consideration the heavy stocks kept up, and the extremes of heat and moisture to which they are exposed, such instances are very rare. About 10 years ago a case of firing occurred near the bottom of a large stack of coal at Calcutta, when about a thousand tons of coals had to be removed; it was then discovered that for a space of about 6 feet square the coal was in a very heated and charred condition. At Aden, in July last, two cases of heating occurred, one in the heart of a stack of North Wales coal, and the other near the surface of a heap of Bebside Hartley (Newcastle) coal. In the course of the last 10 years three or four cases of explosion in the bunkers of the company's steamers have taken place, owing to the *close* covers of the bunkers having been kept on too long; it is, however, one of the company's standing orders to their chief engineers, that the close covers of the bunkers must only be put on when the decks are being washed, or in very bad weather; *grated* covers being used on all other occasions, so as to admit of the escape of the gas generated in the coals—(for the same reason it would be well, were the hatches of colliers lifted on all occasions where practicable). In the company's experience cargoes of the South Wales coal are much less liable to spontaneous combustion than either Newcastle or North Wales coal. The arrangements for stacking the company's coal are as follows:

"Malta	- In sheds, in the open, and in barges, ready for shipment.
"Brindisi	- In the open.
"Aden	- Do. do.
"Bombay	- Under sheds.
"Calcutta	- Do. do.
"Galle	- In sheds and in the open.
"Singapore	- In sheds.
"Hong Kong	- Do.
"Shanghai	- Do.
"Yokahama	- In floating hulk and in sheds on shore.
"King G. Sound	- In floating hulks and in the open on shore."

2605. It would appear that in some places the coal is stacked in the open, while in others it is under cover, the climate in each case being very nearly the same. Is there any particular reason why coal should be stacked differently in the one case to what it is in the other?—At Aden the land on which it is stacked belongs to the Government, our tenure of the land is very uncertain, and therefore we have not erected any sheds there for coal; but at Bombay, and Calcutta, and Shanghai, where we have our own property, where the land is either freehold or leasehold, we have run up sheds.

2606. The company do put the coal under cover where they can?—Yes; particularly at places like Bombay and Calcutta where the monsoon rains are very heavy.

2607. Can you give us any information for the years before 1874 similar to what you have given us for 1874 as to the number of casualties at sea?—I have not such statistics here.

2608. Could you furnish us with a table giving the amount of coal shipped to places beyond the equator, the number of casualties, and the description of coal in the carriage of which the casualty occurred, say for a few years past?—I will do so. I know that 1874 shows a far larger percentage of cases of spontaneous combustion and casualty than any previous year.

2609. (*Mr. Fenwick.*) Are you able to assign any cause for there being so many cases in 1874 as compared with other years?—I do not know the reason of it. The fact has caused a considerable amount of attention. Some people say the coal is not so well cleaned as it used to be, and so a greater amount of pyrites gets into it.

2610. You are not able from your own judgment to draw any conclusion upon the matter?—No.

2611. (*Mr. Young.*) You said that you inspected the coal as it went on board, but you did not take any care about ventilation, that that was left to the shipowners; practically, then, you contract with the shipowner to deliver so many tons of coal at a certain place and you do not care how it gets there?—Very often it is a matter of difficulty to get tonnage at all, and if we hamper a man with all kinds of restrictions as to ventilation he might not be inclined to take our coals. We naturally conclude that a shipowner will take as much care of his ship as he can.

2612. You do not insure the coal yourselves?—Yes, we insure our coal and shipowner insures the ship.

2613. You only take such steps as are necessary to satisfy the underwriters?—Just so.

2614. (*Chairman.*) You do not ensure the coal in a fund of your own?—No, we ensure it in the ordinary way.

2615. (*Mr. Duncan.*) Probably one of the reasons which would prevent you interfering with the owner as to ventilation wovld be that yoor own inspector in whom you have great confidence thinks that ventilation does harm rather than good?—Captain Steinson thinks so undoubtedly.

2616. On the other hand others might think that ventilation would do good?—Yes.

2617. Being regarded as an uncertain matter even by your own men, you do not interfere?—Yes, some are for it and some are against it. Captain Steinson has given strong evidence against ventilation from the bottom, he prefers ventilation from the top by opening the hatches and if possible by having other means of access to the cargo from the deck.

2618. (*Chairman.*) Have the rates you have had to pay for insurance risen much lately?—Yes.

2619. By about how much?—It differs to various ports.

2620. Can you give us the percentage of increase?—I cannot give you that, but I know that after the losses of those three ships on their voyages to Aden, and other ships by fire, the rates did go up.

2621. And they have not fallen since?—I do not think they have fallen since.

2622. So that the company is very much interested in the best information on this subject being obtained as soon as possible?—Yes; because though we insure our coals, still we do not get anything like the value of coal when it has been lost; we merely get the invoice value; we lose the interest of the money and various other matters, and perhaps we have to pay a higher rate of freight on the cargo sent out in substitution of the lost cargo.

2623. You do not insure the coal at the port of arrival?—No; it is only the invoice price of the coal with a per centage added to cover contingencies.

2624. (*Mr. Duncan.*) Have you ever considered whether your casualties were less than those of other parties exporting coals?—We have never discussed the subject so far as I know. We take all the means we can to get the best ships and to have them examined and so on, but it never struck us to inquire whether our per centage of losses was greater than that of others.

2625. You are not able to say whether your vigilant supervision in the shipment of your coals has produced a smaller per-centage of losses as compared with the losses in the case of other ships carrying coal?—No.

2626. (*Mr. Ferguson.*) Those three ships the "Oliver Cromwell," the "Euxine," and the "Calcutta" were loaded under Captain Steinsons superintendence?—Yes.

2627. At the same time that they were loaded was not there another vessel loaded called the "Corah" which was not ventilated and which went safe?—Yes.

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Mr. A. O. Davis.

16 Nov. 1875.

2628. So that the supervision of Captain Steinson being the same over the four ships three were burnt and one not?—Yes the captain of the "Corah" who was an American, objected to ventilation altogether; he said it was a mistake.

2629. The same description of coal was shipped in the "Corah" as was shipped in the other vessels?—I believe it was the same coal and the "Corah" arrived at her destination safely.

The witness withdrew.

Adjourned to Tuesday next at 12 o'clock.

Tuesday, 23rd November 1875.

THE RIGHT HON. HUGH C. E. CHILDERS, M.P., IN THE CHAIR.

PRESENT:

FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
GEORGE DUNCAN, Esq.
JOHN FENWICK, Esq.
JOHN FERGUSON, Esq.
CHARLES ICELY, Esq.
WILLIAM YOUNG, Esq.
J. M. CARMICHAEL, Esq., Secretary.

Captain A. P. Sandeman.

Captain ALFRED P. SANDEMAN examined.

23 Nov. 1875.

2630. (*Chairman.*) You were, I think, for many years connected with the East India navy?—Yes, in Bengal.

2631. For more than 20 years?—In active service 23 years.

2632. On shore as well as at sea?—Entirely afloat during that period.

2633. Afterwards you were surveyor to the London Salvage Association?—Yes, for two years, during the years 1871 and 1872. I was their surveyor in Liverpool.

2634. As such you had a good deal to do with the ventilation of coal-laden ships?—I had special instruction to take an interest in the ventilation of coal ships, and to report the particulars.

2635. Subsequently you have been surveyor in the Marine Department of the Board of Trade?—Since 1873.

2636. In that capacity have you had to turn your attention to the question of ventilation in any way?—No; the Board of Trade take no action in respect of ventilation.

2637. Your official connexion with that question has been as surveyor to the Salvage Association?—Yes.

2638. In that capacity you have formed very strong opinions on the subject, I believe?—Yes, I have had occasion to form a very strong opinion on the subject.

2639. And you wrote a paper on the subject for the Board of Trade, not long ago?—In the early part of this year.

2640. About the time when this Commission was appointed?—Yes.

2641. In that paper you have expressed a very strong opinion in favour of a thorough ventilation of coal cargoes?—Either a thorough ventilation, or no ventilation at all.

2642. But of the two you consider, I believe, that a thorough ventilation is desirable?—I think it would contribute to overcome the difficulties.

2643. Will you state to us, in general terms, what your views of proper ventilation is, and the reasons you would give for it?—The ventilation that used to be adopted varied in its character. One plan of ventilation was this. A platform would be built above the skin of the vessel and from the platform there would be vertical shafts at each hatch, and, in cases where there was no permanent 'tween deck fore and aft trunks on or under the lower beams all running into each other. That ventilation, I think, so far as my knowledge goes, has been very effective in keeping the cargo from combustion. There may be isolated exceptions, but I believe, as a rule, all ships that have been ventilated in that way with coal have carried their cargoes to their destination without any spontaneous combustion.

2644. That practice was in force when you went to Liverpool?—Yes; it had been recommended and encouraged by the underwriters for some time previously, and my instructions were to give it all the encouragement I possibly could. Then a second style of ventilation was merely running an alley-way by means of dunnage wood or boards placed at an angle on the keelson: that gave a fore and aft current along the middle line on each side of the keelson, and into that the vertical hatch shafts were introduced, all the shafts communicating with each other. I do not think that was so good a plan, for it did not give that amount of ventilation under the body of the coal that the platform did, the platform extending, as it did, into the bilges of the vessel.

2645. That was a fixed platform solidly constructed?—A fixed platform solidly constructed, bearers being laid athwart-ships, and heavy deals laid fore and aft, so that there was a current of air passing from the bilges into the midship body of the vessel.

2646. You consider the second plan of ventilation in which dunnage boards were laid along the line of keels on inferior?—I consider it inferior inasmuch as it was rarely that the boards were laid with care—they were generally put up and allowed to shift for themselves after they were up; and in many instances to my knowledge they gave way, and the result was that the coal found its way down on to the skin of the ship, and destroyed the current of air, the ventilation being thereby entirely checked and stopped.

2647. Did the failure of that system lead to any further change?—The next style of ventilation was simply introducing vertical shafts, many shipowners in Liverpool hold that ventilation is of no advantage whatever, and it was only under pressure that they were disposed to adopt it; and in many cases they would merely introduce vertical shafts in the hatches carrying them down as far as the keelson, but there was no current of air kept up by means of those shafts, for they stepped on to the solid body of the coal.

2648. That system failed?—That system was a failure. My experience is that where the platform system was adopted it was evident that the owner of the ship was interested in ventilating his ship as well as he possibly could, and where the simple vertical shafts were introduced, it was simply that he ventilated his ship under pressure to comply with the wishes of the underwriters having no faith in ventilation himself.

2649. Has the first system which you described as being formerly in force, that is to say, the platform system, been practically abandoned lately for the other system?—No, it is still adopted in ships sailing from Liverpool and Birkenhead.

2650. Would you advise its general adoption?—My opinion always has been that ventilation tended to keep the cargo cool, that is if the ventilation was thorough.

2651. You think that imperfect ventilation does not do so?—Imperfect ventilation would do no good whatever, I should say. Sometimes ventilation is very expensively introduced into a ship, but no interest is taken in that ventilation afterwards to protect it from damage when ships are loading, and particularly where ships load their cargoes under the high level or coal tips, eight or ten tons of coal will be shot out of a waggon into the ship's hold where those vertical shafts

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are placed and little or no precaution will be taken to protect the coal from falling on the shafts and damaging them, and I have found in many instances that the vertical shafts have got damaged, and have become choked with coal and been rendered simply useless.

2652. Do you consider ventilation necessary because coal is generally put on board damp, or do you insist upon it in the case of coal which has been shipped thoroughly dry?—I should say it would be practically impossible to ship coal thoroughly dry in Liverpool. It is brought from a distance, in waggons and sometimes it is exposed in those waggons for days. It is very rarely that you have a week of dry weather in Liverpool, and my opinion is that the coal is always wet before it is put into the hold of a ship.

2653. In dealing with the question we must assume that the coal is shipped usually in a wet state?—Certainly some portion of a large cargo.

2654. Is it your opinion, as the result of your experience that where coal is shipped dry ventilation is desirable?—I should say under all circumstances it is desirable. There is a very large amount of pyrites in some of the coal shipped from Liverpool, more in some coal than others. There are some coal owners who hold that their coal is non-combustible and that there is nothing in it to cause heating. On one occasion when I was the surveyor for the London underwriters in Liverpool I had to meet Mr. McCulloch, the inspector for the Government of Madras, regarding the cargo of a ship put back from bad weather. The owner was anxious to condemn it, but though we knew there had been seven feet of water in that ship's hold at one time Mr. McCulloch held that there would be no danger in taking that cargo forward. It was a coal shipped from the mines of Pearson and Knowles.

2655. Containing no pyrites?—Very little or none. I may mention an instance where a cargo of that coal did ignite afterwards. That was in the case of the "Palmyra," last year, which carried a cargo of the same coal to Madras. She had merely a vertical shaft in her hold; she had no fore and aft ventilators whatever, and when the latches were opened at Madras, the cargo was found to be in a very heated state and on fire in one part.

2656. You do not attribute combustion solely to moisture in contact with pyrites?—No, the confined air would conduce to combustion also. I have seen some coal shipped in Liverpool which was heavily charged with pyrites. I have seen veins of brass substance three quarters of an inch to an inch thick.

2657. Is it your experience that it is to the pressence of that brassy substance that combustion is solely due?—I should say so.

2658. You think if coal could be carefully picked so as to contain no pyrites you would have no combustion?—I would not like to say that, but I should say there would be much less liability to combustion. I had to do with a cargo of coal on one occasion in India, a cargo of English coal, loaded in Calcutta for the Persian Gulf during the Persian war in 1855 or 1856, and that cargo was hermetically sealed as effectually as any cargo could be on board ship; it was carried in an American ship, and American ships generally are very strongly sealed. The ship put back from stress of weather, having made a great deal of water, and it was my duty to take charge of her as pilot, and I took her to Calcutta. On the passage there we had some very heavy weather, and having occasion to get out some fresh ropes we had to lift the after hatch, and when we lifted the after hatch we found the cargo on fire. The hatches were put on at once, and we tried to get the vessel into a dock to sink her in the dock, but opening the hatches had given vent to the fire below, and at last the smoke came out to such an extent that after consultation it was found necessary to scuttle her. We accordingly cut holes in her side to scuttle her, having put her on shore, but on account of a falling tide were obliged to cut a hole three feet long before we could get the water in to act on the coal, yet no smoke found its way through the hole, showing how closely the vessel was ceiled. The fire was entirely confined to the midship body of the vessel and aft below; there was no presence of fire above. We found that low down the coals had been on fire.

2659. How many days had she been out?—About a month.

2660. It is very unusual for spontaneous combustion to take place so soon after the cargo had been loaded, is it not?—I do not know of any other such case.

2661. (*Mr. Duncan.*) Were those English coals?—Yes.

2662. (*Chairman.*) Re-shipped in India?—Yes.

2663. (*Mr. Young.*) Had they been lying long on shore before they were shipped?—I think not. I think they were shipped from the stores of the Peninsular and Oriental Company as an accommodation to the Government.

2664. (*Mr. Duncan.*) I gather from what you have said in answer to the Chairman's question that you think spontaneous combustion in coals arises from the pyrites that is found in them?—I think it contributes largely to it.

2665. You do not think spontaneous combustion wholly due to the presence of pyrites?—I have not sufficient chemical knowledge to enable me to say definitely that that is so. I know that cargoes of pyrites after being on board only a few days will frequently be landed in a very heated state. I know that in the case of cargoes coming from the Spanish Main where they have only been a few days on board the steamers, when there has been very heavy weather and when the water has got down into the cargo that it became heated, and the stuff of which those cargoes consist is very much of the same character as that which you will find in coal, it being more soft in the coal than in the Spanish pyrites.

2666. I suppose you consider on that account it is more liable to ignite spontaneously?—Certainly.

2667. Have you considered at all what would be the effect of giving an abundant supply of oxygen to pyrites?—The effect would be to prevent its heating.

2668. But if it had got heated what would be the effect?—If it had got heated I should say the effect would be very bad. The supplying of a superabundance of air would prevent its heating I should say.

2669. If it became heated would it be better to supply air?—If I found a cargo on fire I should certainly batten down the hatches, but it is to prevent the possibility of heating that I would recommend ventilation.

2670. Seeing that pyrites even in the course of a few days, if there is any quantity of it on board the ship, gets heated in some way or other whereby it ignites spontaneously, is it not questionable whether in a cargo of coal containing a large proportion of pyrites, and therefore likely to get heated under any circumstances, you could by any system of ventilation make the air so permeate through the cargo that no part of it could get heated?—I think it has been done; very large cargoes of coal have been carried forward in ships which have been thoroughly well ventilated, there are lines of vessels that have had no casualties whatever in carrying their coal cargoes.

2671. Are you aware whether there are any lines of vessels which have never ventilated at all and yet have carried their coal cargoes safely?—Yes, I believe there are lines of vessels in which a system of ventilation has not been adopted, and which have carried their coal cargoes without any accident.

2672. There are a number of such vessels, are there not?—I believe there are.

2673. You have no statistics to give us showing the number of ventilated ships which have carried their cargoes safely in comparison with the number of unventilated ships which have also carried their cargoes safely?—No, I have not, but I have remarked that some vessels that were well ventilated carried their cargoes without any accident, and I have remarked that others which were indifferently ventilated met with accident.

2674. You recommend ventilation for the purpose of preventing the cargo from getting heated, because

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if the cargo got heated, by supplying air you would be providing the elements for spontaneous combustion?—Yes.

2675. Are you aware that it is oxygen that the pyrites requires to cause it to ignite?—If it is excluded entirely from air it will heat, but if air is supplied to it in sufficient quantities I should say it would keep it from heating; confinement causes it to heat and then oxygen causes it to ignite. I would simply recommend ventilation with that view, to prevent its heating. If ventilation will not prevent its heating, then of course ventilation is not desirable.

2676. (*Mr. Ferguson.*) On what ground have you come to the conclusion that ventilation is necessary at all?—From noticing that ships that have been ventilated have carried their cargoes safely.

2677. You are aware that a great number of ships that have not been ventilated have carried their cargoes safely?—I believe that some large ships have gone away without ventilation and have carried their cargoes safely; but I am not aware that a great many have done so.

2678. Is it from statistics or from observation that you come to the conclusion you have with respect to ventilation?—For two years it was my duty to board every coal-laden ship and to report the particulars as to whether she was ventilated or not; it was very rarely that I came across ships that did not ventilate in some way or other, and in many cases I found that the shipowners took a very large amount of interest in ventilation. I do not know that those shipowers who took that large interest in ventilation were careful to prevent the ventilators from being damaged, but I believe they carried their cargoes safely. The conclusion I have formed is that ventilation keeps the cargo from heating and prevents spontaneous combustion.

2679. Could you give the Commission any statistics with respect to those vessels which you supervised for two years, showing the number of vessels that were ventilated and the number that were not ventilated?—I could name some firms that took a large interest in the ventilation of their ships and whose ships were navigated by men who took a great interest in seeing that the ventilation was properly carried out, and I believe that those vessels were in consequence enabled to carry their cargoes without spontaneous combustion.

2680. Have you any statistics to give us showing the number of vessels that carried their cargoes safely that were not ventilated?—I have not.

2681. What you say about ventilation is a sort of general opinion?—It is more the result of my observation whilst I was occupied as surveyor to the Salvage Association.

2682. We have had the cases of four ships mentioned to us which were all loaded at the same port with the same coal, three of them were ventilated, the fourth was not; the one that had no ventilation took her cargo out with safety, while the other three were burnt; would that fact alter your opinion in regard to ventilation?—In the cases of those three that were burnt it is possible that the ventilators may have become damaged.

2683. Your experience is confined to shipments of Liverpool and Birkenhead coal?—Yes.

2684. You have had no experience of shipments on the east coast?—No. What I had to do with was coal from the Midland districts, from Wigan and from Wales.

2685. Are you aware that in a majority of the ventilated vessels that have been burnt, the fire has occurred near the trunk ventilators which have been put in the hatchway?—I am not aware of that.

2686. Was the coal which was shipped at Liverpool and Birkenhead from various pits?—Yes; I had nothing to do with the shipping of the coal, I had merely to report to the underwriters that such and such coal was being put on board.

2687. You did not investigate the quality of the coal?—No, not beyond looking at it in the waggons.

2688. You only made a superficial observation of it?—That was all.

2689. Did you observe that the vessels took fire which carried coal with a large amount of pyrites in it?—I cannot say that I did.

2690. (*Mr. Duncan.*) What is the result of your observations with regard to the quantity of pyrites contained in coal shipped on the Liverpool side of the Mersey as compared with that shipped on the Birkenhead side?—The coal shipped on the Liverpool side has less pyrites in it.

2691. (*Mr. Abel.*) From your evidence I gather your view of the effect of proper ventilation to be this, that by passing sufficiently rapidly and in sufficient quantity cold air over the heated coal you prevent an accumulation of heat, and you even remove the heat which has been generated?—That is my view.

2692. Do you think it is possible to stow coal on board ship with such care and with such arrangements for natural ventilation as to ensure the passage of air thoroughly through anything like every portion of the mass of coal on board ship?—Not through every portion, but you could carry these trunk ways through various sections so as to ventilate a larger cubical space. At present you have merely two fore and aft ventilators on the middle line below, and probably one or two in the middle body of the vessel, but I would increase those fore and aft ventilators, and so operate on a larger space.

2693. With the very best possible arrangement of natural ventilation, would it not be the case that you would still only ventilate portions of the cargo?—No doubt, but you would reduce the amount of solid coal unventilated. As things stand now there is a very large body of coal that has no ventilation whatever, and the suggestion I make is with a view to carry ventilation through that mass of coal.

2694. Do you think any arrangement of shafting could ensure the carrying of air through the main body of the coal?—I do not see why it should not in the same way as it is carried through a body of rice.

2695. Under any circumstances the ventilation would only be partial ventilation, would it not?—If you arranged the ventilators so as to operate at intervals of 9 or 10 feet I should say, as all the coal does not lie quite solid, that it would tend to reduce the liability to heat.

2696. (*Mr. Young.*) I have a paper before me signed by you dated March 3rd, 1875, at the beginning of which you say, alluding to vessels burnt at sea, "We may with truth say a week now seldom "passes without its sad tale of loss in many "instances of life, as well as of valuable ships, "and all attributable to this cause," and in another place you say, "The sooner it is insisted upon" (that is to say ventilation) "and made compulsory, "the sooner will we hear of the sad and revolting "catastrophes which have lately resulted from spon- "taneous combustion with coal cargoes on foreign "voyages." Are you aware of the number of vessels that have been lost from spontaneous combustion of coal as compared with the number that have gone with safety in 1874?—No. I do not know that there was a large proportion lost, but the losses were very serious.

2697. Should you be surprised to learn that the proportion of losses was about 1 in 2,000?—I am surprised to hear it.

2698. Do you know how many lives were lost in those "revolting catastrophes" that you allude to?—I was alluding then particularly to the loss of the "Euxine" and one or two other vessels; the cases were very revolting, I thought.

2699. Do you know how many lives were lost?—There was a large loss of life.

2700. Should you be surprised to learn that there were only 27 lives lost altogether in 1874?—I should have thought the number of lives lost would have been greater, but you have the data; I have none.

2701. In your paper you appear to point to a compulsory inspection by the Board of Trade, or by the Government, of all ships loading with coals. Do you still adhere to the opinion that such an inspection

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would be advisable?—If ventilation is necessary, it ought to be carried out effectively. Many ships are ventilated and the ventilation is of no use whatever.

2702. Do you think Government interference would would make it effective?—It would contribute to it.

2703. You think ventilation of coal-laden ships could be effectively carried out only by a Government inspection of every such ship?—I do not say that. In my paper I merely said that so far as I knew, the ventilation that was adopted in coal laden ships was often seriously damaged from want of care and want of interest in it.

2704. You recommend that all coal-laden ships should be inspected?—I confess that was my view, but what I recommended in my paper about supervision applied specially to boats.

2705. Have you considered the question how it would be possible for the Government to inspect every coal-laden ship?—I know many instances where, if I had been a Government inspector, I could have been instrumental in keeping the ventilators from being damaged which were damaged and not put to rights.

2706. Do not you think the owner, the captain, and the crew would naturally take care of those things?—There may be no captain with the ship.

2707. Then there would be the mate?—Frequently the mate does not take interest in such matters.

2708. Do you think the supervision of a Government surveyor better than the care which men directly interested in the matter may be supposed to take?—I think it just possible that a Government surveyor's inspection would be better. He might see that it was done.

2709. Are you aware that in 1874 there was shipped from England 12,000,000 tons of coal?—No doubt you are correct.

2710. How many thousand inspectors would that require?—Not many. It does not take a man long to see that the work is being done properly; if he had to direct it himself it would take a very large number.

2711. If the object was to prevent the ventilators being damaged an inspector would have to be always present when a ship was loading?—Under those circumstances it would take a very large staff, but I never intended to suggest any such measure.

2712. (*Chairman.*) Coming to the last point first, there are two ways in which the law might interfere; it might simply require a certain system of ventilation to be applied to all coal-carrying ships, or it might in addition to that requirement direct that inspectors should be appointed to see that it was carried out. Is it your advice to us to recommend that a law should be passed enforcing a certain system of ventilation?—Yes, if it is considered that ventilation is desirable. If my opinion is not justified, of course such a law should not be passed, but if ventilation is desirable it ought to be carried out effectively. Certainly some interest should be taken in ventilation, and my experience is that no interest as a rule is taken in the ventilation of ships, though there are exceptions; there are many owners who take a very large interest in the ventilation of their ships, and there are others who take no interest in it whatever, though ventilators are put into their ships.

2713. You would recommend us to advise Parliament to pass a law enforcing a certain system of ventilation?—Yes, being of opinion that ventilation is desirable.

2714. Would you in addition to that, as an administrative arrangement, not only require that ventilation, but appoint officers to see that the requirement was enforced?—My feeling is that it would be necessary that some one should be present at the loading of the ships to see that the requirement was carried out.

2715. You would not leave it to the ordinary process of law to punish the owner who did not comply with it, but, as I understand, you would require that inspectors should be appointed to see that the law was properly carried out?—I cannot say that I am able to offer a decided opinion upon that point. I should suppose that inspectors would be appointed.

2716. You have not considered the administrative point sufficiently to be able to give us any distinct recommendation in regard to it?—No; I quite feel that there is very little interest manifested in ventilation, and if ventilation is of any advantage whatever possibly it might be necessary that inspectors should be appointed.

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2717. You said in reply to Mr. Young that the strong language you used in your paper was induced by the loss of the "Euxine" and one or two other ships about that time. There were three ships lost about that time, viz., the "Euxine," the "Oliver Cromwell," and the "Calcutta." Are those the three you refer to?—Very likely. The "Euxine" I know was one.

2718. They were loaded in the same month and were lost about the same time?—Yes.

2719. Are you aware that those three are the very ships to which Mr. Ferguson referred when he said that out of four ships which sailed on the same voyage, for the same company, with the same coal, three of them being ventilated and one not, the three that were ventilated were lost, while the one that was not ventilated (a vessel called the "Corah") reached her destination safely?—To my knowledge on one voyage the "Euxine" had her ventilators damaged. Referring to my reports I find I reported that the after ventilation was choked with coal. I think she is a ship that generally loads under the tip in the West Float, and it is a questionable thing whether the vertical shafts of the ships are not in many cases damaged in loading under these tips.

2720. Would not it shake your impression, which was strengthened at the beginning of the year by those three casualties happening just together, to learn that those three were distinctly cases of ventilated ships, those cases having been brought before us pointedly by witnesses as evidences of the impolicy of ventilation, seeing that those vessels were lost while another ship, loaded with coal in the same dock (the Northumberland dock in Newcastle) at the same time and for the same owners (the P. and O. Company), arrived quite safely though not ventilated?—That is a very strong case certainly.

2721. With regard to the cost of ventilation. You have compared the ventilation of rice cargoes with the ventilation of coal cargoes. I suppose the freight of rice is a very much better freight than the freight of coal?—Yes.

2722. So it does not at all follow because a particular system of ventilation could be applied to rice that it could be applied to coal?—An increased freight would have to be charged if an improved system of ventilation were adopted.

2723. What would it cost to thoroughly ventilate on your plan a cargo of 1,000 tons of coal?—I do not think it would cost a great deal. The ventilators are made of rough deals, and rough deals are to be had very cheap. I give you an idea of the expense in my paper, viz., 1*s.* 6*d.* a ton.

2724. 1*s.* 6*d.* a ton is a very serious per-centage, is not it?—It is very trifling when weighed against the additional premium that is frequently charged.

2725. Which has been charged within the last year or two?—Yes.

2726. Have you observed that the premium is apparently out of all proportion to the risk, looking at the per-centages before us?—Yes; the per-centage of loss appears to be very small.

2727. The 1*s.* 6*d.* is a very serious addition to the other charges, is it not?—Yes; it would be an additional expense, no doubt.

2728. When you estimate 1*s.* 6*d.* you take it as the minimum; it might be considerably more?—No, I do not think it would be more.

2729. (*Mr. Fenwick.*) You say some shipowners are very particular with regard to ventilation, and some take no interest in ventilation whatever?—Yes.

2730. To what do you attribute that?—To want of confidence in ventilation, I suppose.

The witness withdrew.

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Mr. M. Anderson.

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MR. MATTHEW ANDERSON examined.

2731. (*Chairman.*) You are a shipowner at Leith?—Yes.

2732. And you have been for some time, we understand, superintending engineer there?—Yes, for the last 12 years.

2733. In that capacity what have been your duties?—I have had to do with the loading of ships and looking after the engines, boilers, the coal, and so on.

2734. The subject of coal has come especially under your attention?—Yes; I was born close to a coal pit.

2735. Have you had any experience in the loading of coal ships?—I have not had to do with any ships taking entire cargoes of coal; but I have seen scores of ships loaded with entire cargoes of coal.

2736. You have not had the superintendence of the loading of those ships?—No; I have merely seen them.

2737. You have had the superintendence of the loading of coal in ships' bunkers?—Yes.

2738. You have arrived at some conclusions on the subject of the proper ventilation of coal?—Yes.

2739. Will you tell the Commission what those conclusions are?—I think that spontaneous combustion always arises from the presence of pyrites—what we call "brasses"—and when the water comes in contact with it it dissolves the sulphur of the pyrites and heat is evolved, and hence the coal ignites after a certain time. I know that from experience. In the district in which my father was a colliery engineer, formerly, when there was no demand for waste coal it was all put into great heaps, and after a certain time the rain or the snow came on to it, and spontaneous combustion took place. I could see from where I lived no less than 20 or 40 of those heaps on fire by spontaneous combustion. My opinion therefore is that when coals, if they contain pyrites (and very few coals are free from it), are put into a ship's hold, as soon as water is brought in contact with them spontaneous combustion takes place.

2740. What is the remedy you would apply to prevent it?—You cannot prevent it, do what you like, only if you could put the coals in perfectly dry and keep them dry there would be no fear of spontaneous combustion.

2741. It is your impression, that whether ventilated or not, coal will take fire at a certain time, if it is wet?—Yes, decidedly so. Ventilation, in my opinion, is only useful when coals give off a lot of gas.

2742. To prevent explosion?—Yes.

2743. But it has no effect in preventing spontaneous combustion?—No. For instance, there was a colliery in the West of Scotland, that was a fire for months and they had no means of putting it out, but a Dr. Gurney took it in hand and he excluded all the atmospheric air, where he could and pumped carbonic acid into it for weeks, and eventually put it out. My idea of the best way of preserving coals from spontaneous combustion is to put perforated pipes down each side, to divide the ship into two halves, each side of the keelson, and to have perforated pipes leading down from the deck. Then I would take a daily record of the heat by lowering a thermometer so as to see whether the heat rose or not. If the heat rose, you might be sure that the first stage of spontaneous combustion had commenced; if it went on increasing, I would exclude the atmospheric air, if it still went on increasing, then carbonic acid gas would be the best thing to put it out, because carbonic acid expels all the atmospheric air. If the atmospheric air were entirely excluded, there would be no oxygen to feed the coals, and hence the fire would so go out.

2744. Then so far as prevention is concerned, you do not think that either ventilation or the absence of ventilation makes any difference?—No.

2745. You think that coal of a certain description, with a certain amount of pyrites in it, and with a certain degree of dampness will take fire whatever you do?—Yes.

2746. And that all we have to look to is to prevent that kind of coal from being put on board in that state, and to provide the best way of putting the fire out when it came?—Yes, that is my opinion, to discover the first stages of it, and check it in its first stages

2747. But you think that no artificial contrivance in the character of ventilation will do any good?—Not when a large body of coals is put on board ship in a damp state.

2748. Your belief is that coals never take fire except they are put on board in a damp state?—No. As a proof of that, I remember the colliery where my father was engineer for, the small coal which was thrown aside and exposed to the wet took fire, but the other coal, which was protected from the weather did not take fire. At times there was not a sufficient demand for the coals to keep the collieries employed, and they used to bring the best coals to the surface, and, to protect them, they used to be put in sheds where they could be kept dry.

2749. And you never knew a case of dry coal taking fire spontaneously?—No.

2750. Your opinion is, that the presence of pyrites, and the presence of moisture are the sole causes of spontaneous combustion?—Yes.

2751. And you are of opinion that under those conditions spontaneous combustion infallibly follows, whatever precautions you take?—Yes.

2752. (*Mr. Duncan.*) Then you disapprove of the idea of ventilating ships by shafts through the hatchways?—To prevent spontaneous combustion, certainly.

2753. You would allow the gases that escape from the coals to get out?—I would make provision for that.

2754. Your opinion clearly is that it is not judicious to put ventilators through the coals?—Except to ascertain the temperature, which I would do by means of those pipes.

2755. Are you of opinion that ventilation might do harm?—If the coals are put in damp, and therefore liable to spontaneous combustion, it does do harm, inasmuch as atmospheric air is one of the elements that is required to dissolve the sulphur; and therefore the more air you introduce, the worse it becomes; the more atmospheric air you add, and the more hot it becomes, so as to give off flame or heat the worse it becomes.

2756. Irrespective of that, in the first stages of spontaneous combustion, is there any element in atmospheric air which would have a tendency to combine with pyrites, and so produce combustion?—The atmospheric air and the water dissolve the pyrites and liberate the sulphur, and then the action takes place upon the coals. That is the first stage of it.

2757. For the purposes of igniting the sulphur, you do not think a gas is required to be combined with it?—No; the gas is the product of the decomposition of the iron pyrites in the coal.

2758. There would be gas evolved if water was decomposed and put into a gaseous state?—Yes. Where do you derive the gas from, if it is not from the decomposition of the coal?

2759. You do not think that thorough ventilation throughout the bulk of the coals would be a matter that this Commission should recommend to be introduced in every ship?—If I had a ship loaded with coals, the plan which I have suggested is the plan I would adopt: that is the only one I recommend.

2760. That is to put perforated tubes down and ascertain whether the temperature was rising or not, and if you found that the coals were on fire, you would force down carbonic acid in order to put the fire out?—Yes. If carbonic acid was not available, those pipes would convey water down below.

2761. Those pipes would only convey a limited quantity of water down, would they not?—If you had a 4-inch pipe that would convey an unlimited quantity.

2762. You would flood the ship with water?—Yes, and that would put it out. If those pipes were like telescopic tubes it would be a very simple process to put them in.

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2763. (*Mr. Ferguson.*) We have had it in evidence that coals carried in iron ships, which were loaded in perfectly dry weather, took fire; how would you account for that?—I would not believe it.

2764. Is it a fact that some coals contain water in themselves?—No; coals contain no water, but coals will absorb water.

2765. Supposing they have not been exposed to any surface water, is not it the fact that there is a certain per-centage of water in some kinds of coal, and more in some kinds than others?—No.

2766. It has been attempted to account for the fact of coals shipped dry taking fire by the theory that they contained a certain quantity of damp in themselves, and that that, along with the pyrites, caused spontaneous combustion?—There are certain elements which go to form coal, I cannot tell you the constituent parts of coal, but I never heard of water being one of them.

2767. I think some of your Fife coal contains a great deal of water?—Simply for this reason, in the Fife coal field there is water adjoining the pits; there is water constantly in the pits, both at the top and the bottom of the seam, but that is an absorption of the water into the coal.

2768. You think that the coal that is said to have been shipped dry may have contained water in it which it had absorbed?—Yes; it very likely may have contained water that it absorbed, but of the elements that go to make up coal, water is not one.

2769. If there was water in the ship's hold and the coal contained iron pyrites, you probably think that that would account for the coal that was shipped in dry weather taking fire?—The water which the coals had absorbed previous to their being put into the ship, and the pressure of iron pyrites, would conduce to generate heat.

2770. Are you familiar with the Scotch coal shipped at Glasgow and Leith?—Yes; I know the Bonnie Hill, the Rough Rigg, the Stan Rigg, and some of those other Wishaw coals.

2771. Are they all equally liable to spontaneous combustion; is the pyrites contained in the coal wrought from all those pits about the same?—In the Rough Rigg and the Stan Rigg it is the same. I cannot go through the whole catalogue of the various descriptions of coal.

2772. Your idea is that pumping in carbonic acid is the proper way of putting out fire which has taken place in coals from spontaneous combustion?—That is the quickest method of stopping the fire.

2773. Do you consider it better than pumping in water?—In the first instance, certainly, because you do not injure the coals to the extent that you do by pumping in water.

2774. Would the carbonic acid injure any other cargoes?—Certainly not; the carbonic acid being heavier than atmospheric air, it has a natural tendency to descend and expel the atmospheric air.

2775. Supposing it was put in at the bottom of the vessel, at the keelson, would it rise and expel the air?—No.

2776. It would lie at the bottom of the ship?—Yes.

2777. (*Mr. Young.*) Where were those heaps of coal which you say you have seen on fire?—In the county of Durham, at the Marquis of Londonderry's collieries.

2778. Were those coals stacked for the purpose of preservation?—No; at that time, 40 years ago, there was no demand for coke, for railway or for other purposes; iron smelting was in its early stage, and the coal was all screened. That was the small dust put away as being useless. They used to make the tracks for the railways with those small coals.

2779. Practically nobody cared whether they were burnt or not?—No, they took no interest in them whatever; they did not take the trouble to set fire to them.

2780. (*Mr. Icely.*) You said that your experience with regard to the stowage of coal was confined to ships' bunkers?—Yes, and what I had seen shipped on the Tyne.

2781. Have you any experience of spontaneous combustion taking place in coal taken into a steamer's bunkers?—Yes, I had one case of a fire.

2782. Could you give the Commission any information with respect to that case?—In that case the fire arose from the coals being put into the bunkers damp, and the bunkers being a little too near the boilers.

2783. You think possibly the communication of heat from the boilers had something to do with it?—The coals had only been in the bunkers a few days when they took fire; the heat was the originator of the combustion.

2784. The heat being communicated by the boilers?—Yes.

2785. At what distance were those bunkers from the boilers?—12 inches.

2786. Do you think it was possible that the heat could be communicated. The boilers would have some non-conducting substance on the outside of them; do you think it would pass through that non-conductor and then through a space of 12 inches and affect the coals?—It did so; and as a means of prevention I put another plate a couple of inches apart from the boilers, so that there might be a current of air between.

2787. It was your impression that the heat was communicated to the coal by the boilers?—Yes; we never had the same casualty again, though we used the same coals afterwards.

2788. Can you tell the Commission whether those coal boxes were ventilated or not?—They were ventilated in the usual way, by taking the lid off when the men went down.

2789. It was simply an exit for the gases that might have accumulated?—It had always been found sufficient.

2790. You say the coals were only a very short time on board?—Yes; they got wet coming off in the craft that brought them to the ship; they caught fire after being out 11 days.

2791. Was it the custom to take the temperature?—No.

2792. How was the fire discovered?—By the trimmers going in to trim the coals. The coals had not got on fire to such an extent as to set the ship on fire, but they were smouldering and hot and ready to burst into a flame.

2793. You were convinced that the fire had arisen from the moisture of the coal?—The coals had gone in damp, and coming on board wet, together with the heat from the boilers, combustion was generated a great deal sooner than it would have been if the coals had been put in dry and there had been no heat near.

2794. That is your only experience of any casualty in the case of coal stowed in bunkers?—Yes.

2795. (*Chairman.*) The pipes which you would pass down in order to take the temperature would admit of air going down too?—Yes.

2796. Would you put taps on them?—Yes; I would screw taps on them, I would make use of them either to put the thermometer down or to put down carbonic acid, or water if carbonic acid was not available.

The witness withdrew.

MR. WILLIAM DARLEY examined.

2797. (*Chairman.*) You were formerly foreman of the yard at Chatham?—Yes.

2798. And lately you have been employed as a Nautical Assessor under the Board of Trade?—Yes.

2799. In that capacity you have had some experience of cases of explosion or spontaneous combustion in coal ships?—Yes, such cases have come under my notice in the inquiries on which I have sat.

2800. How many such cases have you been concerned with?—The "Zeno" was one.

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Mr. W. Darley.

23 Nov. 1875.

2801. Was that a case of explosion or spontaneous combustion?—Explosion of gas. Then there was also the case of the "Berwick."

2802. Was that a case of explosion or spontaneous combustion?—That was a case of explosion. Then there was the "Maria Lee." I think that was not an explosion from coal, but ignition from spirits. Then there was the "Herbert Graham," that was a case of spontaneous combustion.

2803. So that in those inquiries two cases of explosion, and one of spontaneous combustion have come under your notice?—Yes.

2804. Have you any other experience of spontaneous combustion on board ship?—When I was foreman afloat at Sheerness, and had charge of the ships in the harbour there, I found there were cases of spontaneous combustion on board ships in which the coal was stored. Those were cases of extreme heating of the coal, and there was one case occurred in the dockyard, where the coal took fire.

2805. To begin with the causes, what is your impression with regard to the cause of spontaneous combustion of coal?—I believe spontaneous combustion of coal to arise from various causes; one cause is the shipment of "green" coal. I do not consider it safe to ship very green coal.

2806. What do you mean by "green" coal?—Coal taken from the pit's mouth and transferred directly to the ship.

2807. (*Mr. Duncan.*) Would you call it fresh wrought coal?—Yes, fresh wrought coal taken from the pit, and put at once on board ship. In the next place it is not safe to ship coal in rainy weather. If you ship coal in rainy weather it is more liable to ignite spontaneously.

2808. (*Chairman.*) With regard to "green" coal you consider that shipping the coal in a "green" state is a cause of danger whether shipped in a damp state or not?—Yes.

2809. Danger in the sense of spontaneous combustion or of generation of gas leading to explosion?—Both.

2810. Have you had any experience of spontaneous combustion in dry coal?—No; in the case I referred to which occurred in the dockyard the coal was shipped in very wet weather.

2811. So far as spontaneous combustion goes your experience is only of coal which has absorbed moisture?—Coal which has been exposed to moisture.

2812. As to "green" coal, how does that produce spontaneous combustion?—When it is wrought from the pit it is full of gas; if it is exposed to the atmosphere previously to being shipped some of that gas is emitted that would be otherwise retained, but when confined it becomes dangerous and ultimately heats.

2813. Does the presence of that gas in dry coal lead to heating or only to explosion?—I judge that the "green" coal is never very dry. I think there is a certain amount of humidity in it.

2814. So that in the long run it comes to moisture being the cause of spontaneous combustion?—Yes. The tendency of wet is to cause a decomposition of the coal I believe.

2815. It comes therefore to this, that the cause of spontaneous combustion in your opinion is moisture, however that moisture may be generated?—Yes. In the case to which I referred as having occurred at Sheerness I had a correspondence with Mr. Rogers who had charge of the coal depôt there. I wanted to satisfy my mind upon it, and he told me that the coal was shipped in wet weather, and in each case where I have come across coals that have been destroyed by fire I have found on inquiry that wet has had something to do with it.

2816. That being so, I suppose your opinion is that the first precaution which should be taken is not to ship wet coal?—Not to ship wet coal.

2817. That would be the best of all remedies?—Yes.

2818. What is the next preventive measure you would take—In the next place I would put it into a dry ship.

2819. Assuming coal to be shipped which was not perfectly free from moisture, what appliance would you use in order to prevent spontaneous combustion?—You want to keep it dry. There are some coals that do not require so much ventilation as others; it depends on the quality of the coal. In some it is necessary, I believe, that you should have no ventilation at all (or at least only surface ventilation), or the tendency would be to cause spontaneous combustion. As far as my experience goes I would not offer an opinion whether earthenware tubes introduced into coal liable to spontaneous combustion would not produce a beneficial effect in the earlier stages, because when the gases are compressed and confined the tendency, I believe, is to heat the coal, and then danger arises; but perhaps if the gases were allowed to escape from perforated pipes that might be prevented; but that is a matter of speculation.

2820. You are not able to give us any distinct opinion of your own upon the question whether ventilation does or does not obviate the danger of spontaneous combustion?—No, I have never heard of ventilation generally injuring coal. I have found in the generality of cases where coal has sustained injury that it has been in the absence of ventilation.

2821. In the case of the "Herbert Graham," was the ship well ventilated?—I do not think she was properly ventilated, and I am doubtful whether she was a very dry ship. I cannot remember positively whether the coals were shipped wet in the "Herbert Graham." If they were shipped wet it would account for the spontaneous combustion.

2822. You do not remember whether there were any appliances for ventilation in that ship?—From my inquiries I was not perfectly satisfied with the ventilation.

2823. What is your recommendation as a whole upon the subject of ventilation. I gather that in the case of some coal you would not ventilate it at all?—In the case of some coal you need to be very cautious in ventilating it. The fact is on that point I am hardly competent to give a decided opinion; there are some cases that are a little doubtful, and they want experiment.

2824. This Commission being appointed specially to report upon that question, you do not feel able to give us any very distinct recommendation upon the subject of ventilation?—I think that surface ventilation cannot do any harm. I think it would be well to test, by experiment, the effect of the introduction of earthenware tubes into cargoes of coal known to be liable to spontaneous combustion. It might probably be found that the introduction of such tubes would have a beneficial effect; that is to say "before" heat has been generated. I believe, as others have observed, that the effect of introducing atmospheric air afterwards would be only to increase the combustion.

2825. Do I rightly gather that you would recommend that experiments should be made to test these matters?—Yes.

2826. So far as explosion is concerned you are of opinion that every facility should be given for carrying gas off?—Yes.

2827. Would you do more than that?—Yes; I would insist that the coals, after being taken from the pit, should be exposed a certain time to the atmosphere in order to allow for the escape of the gas.

2828. After they were on board all you would do would be to ventilate the surface?—After they were on board they should be kept dry and be properly ventilated. I know of no better system of ventilation than that introduced in the Royal Navy, and which I explained to the court at Hull in the case of the "Zeno." There are some matters of detail which I could add to it, and particular modifications might be applied to particular sorts of vessels. The system to which I refer is a system of pipes and cowls—a system which has been introduced into the Royal Navy with the greatest possible success. Some men would object to going to the expense of large iron tubes, and in some cases copper tubes, where they come near the binnacle, but

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wooden trunks might be used with advantage, and in some cases wind sails.

2829. That is for surface ventilation?—Yes; and I would recommend that you should carry it into the body of the coal also. Take the case of Cardiff hard brittle coal, you may ventilate it to any extent. I believe the principal danger that you find in coal of that description is that when a naked light is brought into proximity to it an explosion takes place. In each case of explosion that I have come across in that coal the explosion has taken place in consequence of a man taking a light below. Then I think the system of fitting up a ship should be such as to prevent the gases accumulating, so as to prevent parts of the ship where coal is not stowed acting as receptacles for gases.

2830. I think M. Vassard, whom you examined in the "Herbert Graham" case, in answer to a question put by you, said that in the case of coal containing pyrites there should be no ventilation, as it was liable to ignite spontaneously, and that ventilation was only useful in the case of coal containing no pyrites, in which case it was of use for carrying off the gas and to prevent explosion. Is that your view?—I should defer to the opinion of M. Vassard on that question; he is a chemist and more competent to give an opinion on such a point than I am.

2831. Do you agree with M. Vassard?—Yes. In addition to a system of ventilation for the coal, it is necessary that precautions should be taken for the ventilation of the ship. This is a drawing of the "Zeno" (*producing it*). This (*pointing to the compartment the fore side of the coal hold*) became a receptacle for the gas generated from this coal. The bulkhead not being watertight or not being airtight, the gases that were generated here passed through, and the result was that this was made a receptacle for the gas. This (*pointing to it*) was used as a water ballast tank, and there was a pipe leading from here into the hold to let the water off, and I believe there were a couple of holes in the deck, to allow the gases to escape and to run off any water that might be here into the ballast tank. That answered two purposes; whilst it allowed any wash of water to run down it also allowed the air to arise; consequently this (*pointing to the compartment the fore side of the coal hold*) always became a receptacle for gas. When one of the men went down through the forepeak with his light the gas exploded, blowing him into the bows of the vessel, and in 50 minutes there was 33,000*l.* worth of property gone, and 29 hands had to take to an open boat in the Bay of Biscay.

2832. (*Mr. Duncan.*) You say that there is greater danger of spontaneous combustion if the coals are shipped wet. Have you formed any definite opinion as to the effect of water upon the coals in producing spontaneous combustion?—A chemical action goes on, I believe, on the introduction of water into the coals, tending towards spontaneous combustion; and there is a demonstration of that in the circumstance that in those cases where spontaneous combustion has taken place the coal has been brought in contact with the wet either by being shipped wet or by being put in a wet ship.

2833. Supposing you were told that in numerous cases where the coals had been shipped as dry as possible those coals had taken fire, and in addition to that, as appears from the statistics which have been taken, it turns out that the coals in which the greatest number of cases of spontaneous combustion took place were coals shipped in the three driest months of the year, would that have any effect upon your judgment?—It would lead me to hesitate in giving a definite opinion with regard to wet; but of course there are different descriptions of coal, and what would affect one would not affect the other.

2834. Did I rightly understand you to say that water does not affect Cardiff coals?—I believe that water does affect them, that is that they are better kept dry, but I have come across no cases of spontaneous combustion in Cardiff coals that have been wet.

2835. Has it ever occurred to you to inqure whether the component elements of Cardiff coals, and of those other coals that have taken fire frequently are different from one another?—Yes, I believe they are different from one another as shown by the different effects produced, because one will explode and the other will ignite. The coal from Cardiff, particularly the Cardiff hard brittle will explode. I do not know (because I have not got extensively into it) whether you will find that it is liable to ignite spontaneously, but in some correspondence which I have had with people at Cardiff and which is contained in a paper which I beg to hand in (*handing in the same*), they tell me that they have come across no cases of spontaneous combustion in that coal.

2836. Do they say what spontaneous combustion arises from?—Yes, the presence of a large quantity of iron and sulphur in the coal which, when acted on by water, produce a chemical action, causing spontaneous combustion.

2837. It is clear that there are two elements of danger in coals. Is your recommendation to the Commission that different courses of action should be taken with coals that have those different dangers in them?—Yes, decidedly.

2838. That is to say that those Cardiff coals that are liable to explode should be differently dealt with from those that have large quantities of pyrites in them?—Yes, just so. My experience has been more particularly in cases of explosion. I have only sat as nautical assessor on one case of spontaneous combustion, that of the "Herbert Graham." Then there was the case that occurred at Sheerness where the coal took fire, in that case the coal had been exposed to wet.

2839. In the case of the "Herbert Graham," was the quality of the coal shipped on board a subject of inquiry?—Yes. Mr. Vassard was present and gave his report. I think you will find the report in the evidence.

2840. Do you remember whether the coals that that vessel had on board were more dangerous than the coals ordinarily shipped?—I cannot charge my memory with that.

2841. You are not prepared to speak definitely as to what precaution should be taken in the case of ships having on board these coals which are highly charged with pyrites and liable to spontaneous combustion?—No; I would not give a positive opinion upon that. I would suggest that a great deal might be gleaned by the Commission from those who are constantly shipping the coal. No doubt also coal owners at different ports for their own interest would be glad to give you information upon the point.

2842. (*Mr. Ferguson.*) You say that some coal requires ventilation, will you tell the Commission on what grounds you come to that conclusion?—From the terrible explosions that have taken place where ventilation has not been attended to.

2843. That is in reference to Cardiff coal that explodes, not coal that is liable to spontaneous combustion?—Just so.

2844. Is that system of ventilation by which the gas is taken from the top of the coals to the deck by pipes and cowls the system which you say has been adopted in the Navy with success?—Yes.

2845. In the coal-carrying vessels of the Navy have there been fewer explosions than in other vessels carrying coals?—I believe you will find that to be the case.

2846. Has the system to which you refer been adopted in the vessels of the Navy as well as in vessels carrying coals for the Navy, and does the answer you give with respect to comparative immunity from accident apply to both classes of vessels?—Yes.

2847. Do they keep some vessels of their own to carry coals in?—I believe in some cases they do. At all events they have vessels in which their coals are stored as coal depôts, where they remain for a considerable time.

2848. Your experience has been more in the explosive coal?—Yes.

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Mr. W. Darley.
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2849. You cannot say whether ventilation is good or whether it is bad in the other kind of coal?—I cannot say positively.

2850. (*Mr. Abel.*) Your experience with regard to explosions on board coal-laden vessels is limited to two instances?—Yes; it is limited to two instances.

2851. You have no idea what proportion of casualties is ascribable to explosions on board coal-laden ships, and whether it is large or small?—I believe there is a great number of coal-carrying ships in which explosions take place, many that you hear nothing of. When we were sitting at Hull on the "Zeno," a vessel exploded, I could not tell you her name, and there was a loss of life. There was one case I read about in which 22 men out of 23 were blown into the air. Another where 8 were blown into the air, 4 fell overboard and were drowned, and 4 fell dead upon deck. Such cases are of common occurrence. I have not the slightest doubt that a great many cases have occurred, in which vessels have been lost from explosion, and all hands sacrificed. In this case of the "Zeno," 29 people had to put to sea in an open boat, and if there had been the usual weather in the bay, they would have been all lost, no doubt. The evidence that that vessel was not properly fitted was very clear, and in fact, it was admitted by the owner of the vessel, for when I was in the court I expressed an opinion that the vessel was built for one purpose and used for another, and the representative of the owner rose and admitted that that was the fact, that she was built for a general cargo, and in that exceptional case she was used for a coal cargo, that coal being a dangerous coal.

2852. (*Mr. Icely.*) With regard to the casualty which occurred at Sheerness, that was in a hulk?—Yes.

2853. Did any case of spontaneous combustion or explosion ever come under your notice in the case of any ship afloat having coal on board?—I have never known any such case in any vessel belonging to the navy.

2854. Are you aware whether it is the custom to keep coal in navy ships in harbour for any length of time?—No.

2855. Is not there a First Division of Steam Reserve, consisting of vessels having coals and other stores always on board?—There is a certain quantity of coals on board such vessels, but I do not think the bunkers are all filled up.

2856. Those ships are supposed to be ready for sea, and they have all their stores on board, coal included?—I am not able to speak confidently on that point.

2857. Are you aware that some of those ships will remain probably a year or two without being employed the coal still remaining on board?—I have not known any vessels remain in the First Division, at Sheerness, so long as that.

2858. Not for a twelvemonth?—No, I do not think so.

2859. For six months?—I should think they have perhaps for six months.

2860. During that time you never heard of any accident occurring?—No, I have heard of cases of the coals becoming heated and in those cases the engineers, who are very careful men, watch the coals; they daily test the heat of the coals by the thermometer tubes, and if they have any doubt of their safety they have them removed either to another bunker, or on deck.

2861. You attribute the immunity from accident in those ships to those precautions being taken by the engineers?—Yes, and the system of ventilation that is generally adopted.

The witness withdrew.

Adjourned.

Tuesday, 15th February 1876.

PRESENT:

GEORGE DUNCAN, Esq., IN THE CHAIR.

FREDERICK AUGUSTUS ABEL, Esq., F.R.S.
RICHARD CORY, Esq.
JOHN FENWICK, Esq.
CHARLES ICELY, Esq.
WILLIAM YOUNG, Esq.
J. M. CARMICHAEL, Esq., Secretary.

Mr. W. J. Prim.
15 Feb. 1876.

MR. WILLIAM JACOB PRIM examined.

2862. (*Chairman.*) You are resident engineer to the Houses of Parliament?—Yes.

2863. And you were formerly chief assistant to the Manchester Steam Users Association?—Yes.

2864. How many years were you there?—About eight years.

2865. And that was about the year 1865?—Yes.

2866. Was that when you left the Association?—No, I left in 1868. I have been at the Houses of Parliament since 1868.

2867. And I believe you became acquainted with a patent for extinguishing fire by means of steam while you were at Manchester?—Yes; patented by a Mr. Robert Hollingdrake for mill purposes.

2868. What was he?—An ironfounder in Stockport.

2869. And can you tell us anything about the successful application of this patent?—It answered the purpose to a certain extent, but it gave a good deal of trouble from the fact that the steam spread about so much that it rusted the machinery; so that if there was a fire in one corner of the room all the machinery throughout the room was rusted; and consequently I believe it fell into disuse. Another difficulty, and a serious one in my estimation, was that in a large room where there was a very large area of cooling surface the steam condensed very quickly, I consider that in any place where there is a large number of rooms, or a large cooling surface such as skylights or open iron roofs, that would be fatal to the system, because the steam would condense readily and not have any effect on the fire.

2870. And I suppose if the windows were knocked in, it would have the same effect in that respect?—Yes, or if there were staircases open that would convey the steam away.

2871. You are not able to tell us of this invention having been used for any length of time successfully?—I cannot say that it has been used successfully. I have lost sight of the matter for some years; but it struck me that it might be used successfully on board ship where the hatchways can be battened down. In a confined space it might be used successfully.

2872. Then how would you propose to fit a vessel with it?—By running pipes in various places.

2873. With holes perforated in them?—Yes, and commanding cocks, so that steam would only be turned into such places as was necessary.

2874. I suppose you would hardly expect that the steam would permeate through a large stock of coals very far, particularly if there were much small among them?—No; but if the pipes were carried in various directions I am of opinion that the fire might be held in subjection for a considerable time, instead of breaking out and destroying the whole cargo.

2875. I see that you suggest our examining the patentee?—I thought that he might give more in-

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formation about it, and might tell you where the difficulties were in applying it.

2876. I suppose you are aware that there are a good many patentees that have ideas about putting fires out?—I am aware of that.

2877. You have no particular knowledge of your own in reference to the application of steam in putting out fire?—Excepting on a very small scale. I have tried it on a small scale and found it very successful. In fact the small scale on which I tried it was with a kettle and a candle and also a gas burner. I found it very successful when applied to a strong flame of gas. I have also tried it in a chamber where the steam was at a very low pressure so that I could bear my hand on the windows, and successfully put the fire out. This chamber was 16 feet long by 6 feet wide, and 10 feet high.

2878. You have never had any risk of the Houses of Parliament being burnt down from spontaneous combustion in your stock of coals, and used this means of putting the fire out?—No.

2879. Or have you on any other occasion dealt with fire in masses of coal, putting it out, whether by steam or otherwise?—No.

2880. (*Mr. Cory.*) I suppose the steam would require to be of some considerable pressure in order to produce an effect on fire?—No.

2881. Supposing there was a fire in this room, and it was filled with steam, would it have any effect on the fire?—Yes, I think that at a very low pressure it would answer.

2882. Such a pressure for instance as would not break the windows?—Yes; the pressure of the steam was scarcely anything above the atmosphere.

2883. (*Mr. Icely.*) It would not be hermetically sealed?—No. Of course steam would escape through the keyholes and various chinks.

2884. (*Mr. Abel.*) The arrangement which you have referred to, the system of perforated pipes, seems to be rather an obvious mode of applying the steam. Could you point out any special feature in this particular patent?—As it is necessary in cotton mills to keep the temperature pretty high so as to prevent the oil in very fine machinery from clogging, heating by steam pipes running all round the rooms is adopted, and the invention consisted in making those pipes with a diaphragm through the centre, so that one half acted as the ordinary steam or heating pipe, and the other half was perforated so that at any time steam could be turned into this perforated pipe and diffused through the room.

2885. The invention was chiefly applicable to cotton mills, or factories of that kind?—Yes, where steam was already in existence.

2886. Probably a much more simple arrangement would apply the steam in the hold of a vessel?—Yes, much simpler.

2887. (*Mr. Young.*) Have you ever reflected, with regard to this invention as applied to coal-laden ships, on the cost and trouble that it would give?—Very much would depend upon the construction of the vessel and the nature of the bulkheads. If you get the steam into small spaces it would be very much simpler than having one large hold. I should consider that in a steam collier, where boilers are constantly under steam, the cost of fitting up an apparatus of this description would be, perhaps, such a matter as 5*s.* per ton burthen.

2888. Unfortunately from all we have seen and heard it is not on board steam colliers and in short voyages that the danger is apprehended, but on board large vessels and vessels going on long voyages, and not merely destined for coal, but going for the purpose of bringing home other cargoes?—It that case it would be necessary to have a boiler on board; that boiler could be used for cooking and general work on board.

2889. With a donkey-engine, you mean?—Yes; for working capstans and hoisting in and out cargo, &c.

2890. (*Mr. Fenwick.*) Have you any proposition to make as regards the fitting of a coal-laden vessel with regard to these pipes of which you have spoken; do you propose running them through the centre of the ship or the sides?—I would keep them as low as possible (as the steam will naturally rise) in the bilges, and in places where they would be accessible when the cargo was out, and in some cases, if possible, accessible when the cargo was in; and I would suggest having cocks so that steam could be turned on in sections. If it was known where the fire was located then the nearest section to that could be turned on.

2891. By means of pipes leading up to the deck?—Not necessarily to the deck; to places where they would be accessible, to such parts of the ship where a person could get down to the bottom without going down through the cargo.

2892. (*Chairman.*) When a vessel is loaded with coals she is nearly as full as she can hold, you would therefore have to make tunnels to get down to the coals?—In some cases there are portions of the vessel running very fine aft and forward where there are no coals.

2893. As a rule they are filled up within a foot or two of the deck all over the body of the ship. You would see that there would be considerable expense if you were to make tunnels to get to the cocks?—Decidedly, if it were necessary.

2894. (*Mr. Icely.*) There would be no difficulty in fitting the cocks with spanners leading to the upper deck, would there?—Not the least.

2895. (*Chairman.*) You would see the difficulty there would be in preventing the coal dust from getting into your pipes; you would have to cover them with something in order to prevent that?—Yes. Some provision should be made in the nature of a shield, so that the steam would have to pass some short distance before it came into contact with the cargo.

2896. You would have a wooden box and holes in the sides of it, and the top covered, I suppose?—Yes, something of that sort. With a properly constructed shield any little dust that there was would be blown away, so long as it was not forced or pressed into the orifice of the steam pipes. The pressure of steam would be sufficient to blow that away.

2897. Have you anything else to say on this subject?—I would observe that I consider that a hose could not be worked very well with steam in it, even if you had a hose on deck. A leather or canvass hose could not be worked advantageously with steam, because if there were the least hole in the hose the steam would escape rapidly; and in binding up the hose steam would not be so easily dealt with as water.

2898. Have you anything further to add to your evidence?—I think not.

The witness withdrew.

Adjourned.

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Smelting coal, containing iron pyrites, shipped wet, is very liable to take fire; bituminous coal is used for smelting, 1419–1423, 1450, 1456, 1485–1490, 1496–1503.
Case of the "Minnie Grahame;" she was lost under similar circumstances to the "Herbert Grahame," 1386, 1404, 1425, 1480–1482.
Application of carbonic acid gas to fire in the hold of a ship; it could only answer where the air was totally excluded, 1424, 1427, 1428.
South Wales coals; first-class steam coals are not likely to take fire; different kinds of smelting coal; many have never taken fire, 1432, 1456–1463.
Does not know a case of spontaneous combustion in north country coal, 1432.
Premiums on coal-laden ships; they have a tendency to go up, 1441–1449, 1483, 1484.
Has known several cases of explosions in Cardiff, 1491–1492.

Birkenhead.
Regulations for loading coal at, *App.* pp. 124, 125.
Statistics of coal vessels sailing from, *App.* p. 127.
See *Tables.*

Bisulphide of Iron.
In coal, 1815.

Bladon, Mr. John. (*Analysis of his Evidence.*)
Is a coal shipper at Newport, 1504–1506.
Shipping of coals; at Newport it is done by a shoot; they are shipped in about the same time as formerly; shipping in haste is not a cause of combustion or explosion, 1507–1509, 1540–1543, 1572–1575.
Newport coal; it consists chiefly of steam and house coal; very little smelting coal, 1510–1512, 1514, 1515, 1540–1559.
Steam coal is less liable to spontaneous combustion than house coal, which contains more iron pyrites, 1511, 1518, 1524–1527, 1555–1559, 1562, 1563.
Ships that carry Newport coal are of almost all classes, 1513, 1516, 1517.
Has never heard of cargoes of large well-shipped steam coal taking fire, 1521.
Large quantities of coal are more likely to take fire than small, 1521, 1550.
Attributes spontaneous combustion of coal to its being shipped wet; this might be prevented if expense were no object, 1522–1527.
Ventilation, where coal is shipped dry, might prevent combustion; with wet coal it would promote combustion, 1528–1531.
Stacking of small coal; in the pit, combustion occasionally takes place; instance of heating of coal in store, when wet, 1532–1539, 1544–1546, 1549–1551.
Has not known of spontaneous combustion occurring in patent fuel; none shipped at Newport, 1547, 1548.
Shippers can judge what coals may be liable to spontaneous combustion, 1557, 1558, 1560, 1564.

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Bladon, Mr. J. (Evidence of)—*continued.*
Does not consider the high price of coals to have affected cases of spontaneous combustion in ships, 1559–1561.
Cannot state what coals in South Wales are liable to ignition; general reports about them may be heard, 1564–1571.
All coal suffers by exposure to the weather, 1576–1579.

Board of Trade.
Unsatisfactory result of inquiries under, respecting casualties to coal-ships, *Rep.* p. v.
Statutory inquiries held by, *App.* p. 4.
Correspondence between, and local marine boards, *App.* p. 25.
Inquiries by, into cases of gas explosions, *App.* p. 41.
Present Commission recommended by, *Q.* 15–17.
Correspondence of, with Lloyd's and London Salvage Association, *Rep.* p. v.; *App.* p. 1; *Q.* 16.
Takes cognisance only of British ships, 27–30.
Takes no action regarding ventilation of coal cargoes, 2636.
See *Ships carrying Coal.*

Boilers.
Separation of coal boxes from, in Navy vessels, 616.

Boston Gaslight Company.
Coal used by, *App.* p. 114.

Box System.
See *Shipment of Coal.*

Bramley-Moore.
Regulations for working high-level coal-trade at, *App.* p. 125.

Breakage of Coal.
See *Coal.*

British Ships.
Board of Trade takes cognizance only of, 27–30.

Brooker, Mr. Orestes. (*Analysis of his Evidence.*)
Is employed at Portsmouth; was formerly inspector of coal for the Admiralty in Northumberland and Durham district, 973–976.
Shipped about 50,000 tons of coal for the Admiralty; heard of only one case of spontaneous combustion of Government coal; believes it was at Jamaica; objected to sulphurous coal; was instructed to have coal fresh raised, screened from dust, and properly shipped, 977–995, 1013–1025, 1055–1096.
Storage of coal at Portsmouth; the coals are in heaps about the dockyard, and afloat in the hulks; there is much small coal sometimes; they are exposed to all weathers; has never heard of any case of heating, 996–1003, 1026.
Is in favour of ventilating coal cargoes; the gases may be got rid of by putting tubes into the centre of the cargo, 1027–1049.
Heating of coals on board the "Crocodile;" their temperature rose to 136°, but was lowered by opening the outside ports, 1028–1049.
Coal-boxes on board ship are fitted with temperature-tubes, into which the thermometer is put every four hours, and oftener in time of danger, 1036.
Imagines that coal shipped wet, with much small in it, and not well hand-picked, would be liable to spontaneous combustion, 1050–1054.
The frequent cases of spontaneous combustion when coal was dear might have been partly due to the fact that the coal was not so well hand-picked, 1067.

Brown's Coal Lists.
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C.

Callao Trade.
Guano vessels in, have platforms, 1338.

Cambridge (Mass.) Gas Company.
Statement from, *App.* p. 113.

Cannel Coal.
See *Coal.*

Carbonic Acid Gas.
For extinguishing fires in coal cargoes; not recommended by Commission; *Rep.* p. xxiv.; *Q.* 763, 1424, 1469, 1817, 1823, 1843, 1901, 2743, 2772.

Cardiff.
Explosion of coal-ship at, *App.* p. 59; *Q.* 1491.
Inquiries by Chamber of Commerce of, 1362.
Coal of, liable to explosion, 2829, 2834–2838, 2843.

Casualties.
See *Explosions of Coal in Ships; Spontaneous Combustion of Coal.*

Cawkitt, Captain James. (*Analysis of his Evidence.*)
Is manager of the Salvage Association at Liverpool, and chief surveyor to the local underwriters, and was previously master of ships in the Indian trade, &c., 2430–2433, 2462–2464, 2480, 2481.
His experience in shipping coal is chiefly confined to Liverpool and Birkenhead, 2434, 2500–2502.
Has observed considerable increase in casualties with Lancashire coal; the coal has been smaller than formerly, 2434–2449, 2475–2479.
Value to underwriters of Mr. Rundell's coal statistics, 2442, 2444, 2526, 2527.
Premiums on shipment of Lancashire and other coal have risen; underwriters are guided by Mr. Rundell's statistics, 2447–2449, 2500–2502, 2518–2531.
Casualties are partly attributable to shortness of time between coal being worked and put into ships; also to damp small coal and to inferior coal being shipped, 2450–2452, 2465–2476, 2494–2499.
The more coal is liable to spontaneous combustion the less it is liable to explosion, 2452, 2491.
Recent increase of accidents has resulted from heating more than from explosion, 2453.
Case of explosion on board the "Mary Amelia," loaded with South Wales steam coal; no ventilation; caused by taking below a naked light, 2453.
Casualties with Barnes' Lancashire coal, 2442, 2477–2479.
Is strongly in favour of ventilation; would have a platform, perforated, and ventilating shafts up each hatchway; recent accidents not due to ventilation, 2454–2461, 2465–2476, 2482–2490, 2516–2518.
It is most important that coal should be shipped dry, 2461, 2496.
Captains, &c. who load coal do not sufficiently calculate the danger, 2484.
Few coal ships carry a thermometer to test the temperature of the coals, which they should do, 2485, 2514, 2515.
South Wales steam coal is not liable to heat, but to explode, 2491–2493.
Most burnings have occurred under the main hatch, where small coal has accumulated, 2498, 2499.
Since the accidents witness has noticed the colliery from which coals are obtained, 2503.
Increase in cases of spontaneous combustion in ships from Birkenhead and Liverpool, 2504–2506.
Coal-ships have improved of late, 2508–2510.
Shipowners take great pains in seeing to the shipping of coal, 2511–2513.

Chaffee, Hon. K. S.
On spontaneous combustion of charcoal, *App.* p. 112.

Chamber of Commerce of Cardiff.
Inquiries by, respecting casualties to coal ships, 1362.

Charcoal.
Spontaneous combustion of, *App.* p. 112.

Charter-parties.
Ventilation of coal ships required by, 1668.

Chemical Analysis of Coal.
Letter respecting, *App.* p. 109.

Circulars issued by the Commission.
Information collected by, *App.* p. 66.

Coal.
Certain descriptions dangerous for shipment on long voyages, *Rep.* p. viii., xxiv.
Record of coal exported desirable, *Rep.* p. viii.
Breakage of Coal and *Small Coal*; conduce to spontaneous combustion; promoted by shipping by tip, *Rep.* ix., xix., xxiv.; *Q.* 76, 107, 108, 157, 941, 966, 1151, 1283, 1320, 2107, 2496, 2542.
Wet Coal, danger arising from; conduces to spontaneous combustion, *Rep.* p. xx., xxiv.; *Q.* 37, 122, 554, 716, 748, 827, 867, 874, 958, 1050, 1341, 1415, 1500, 1522, 1815, 1874, 2086, 2177, 2368, 2461, 2496, 2551, 2575, 2739, 2782, 2814, 2832.
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Danger of coal brought too soon from pit to ship; it should be exposed to the air, 348, 422, 1572, 2427, 2450, 2805, 2827.
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Inspection of vessels containing coal desirable, 843, 2704.
Main hatchway of ships should be filled with large coal, 1320, 1333, 2556, 2561.
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Covey, Mr. William. (*Analysis of his Evidence.*)
Is Chief Inspector of Machinery, and has charge of the steam reserve, 1097, 1099.
Storage of coal ashore at Devonport; some is housed, and some is not, 1100–1103, 1129–1134.
Has never seen any case of heating of coal, 1105, 1107, 1128.
Approval of ventilation of coal cargoes; there should be ventilators in the bunkers, 1110–1127.
Case of explosion of gas in the "Agincourt" and the "Devastation;" if the bunker-lids had been taken off every day explosion would not have occurred, 1112–1127.
An order has been given to the whole service that coal-boxes are to be ventilated, 1119–1123.
Has never known cases of explosion in wooden ships, where there is more likely to be admission of air, 1135.

Crane for Loading Coals.
See *Shipment of Coal.*

D.

Dangerous Coal.
See *Coal: Coals—Classes.*

Darley, Mr. William.
On prevention of gas explosions, *App.* p. 53.

——— (*Analysis of his Evidence.*)
Was formerly foreman of the yard at Chatham, and has been lately Nautical Assessor under Board of Trade, 2797, 2798.
Has had experience of cases of explosion and combustion in ships; cites instances, 2799–2804, 2850–2852.
Spontaneous combustion of coal; it arises from shipping "green" and wet coal; coals should be exposed after being taken from pit, to allow escape of gas; has not known a case in a vessel belonging to the Navy, 2805–2817, 2827, 2832, 2833, 2853–2861.
Moisture is the cause of spontaneous combustion of coal, 2815.
Coal should be put into a dry ship, 2818, 2819.
Ventilation of coal cargoes; ventilation on surface cannot do harm; only useful for coal containing no pyrites; some coal must be ventilated; approves of Royal Navy system, 2818–2831, 2842–2849.
Cardiff coal; its danger of explosion, not of spontaneous combustion, 2829, 2834–2838, 2843.
Different kinds of coal require different courses of action, 2837.
Navy engineers test their coal cargoes with the thermometer; immunity from accident attributable to this, and to their system of ventilation, 2860, 2861.

Davis, Mr. Arthur Owen. (*Analysis of his Evidence.*)
Attends from Peninsular and Oriental Company, 2580.
States number of shipments, and classes of coal shipped for Company in 1874, 2581–2585.
In 1874, had four ships burned, three of them loaded with Howard's West Hartley; and one missing, loaded with Scott's Brymbo; coal was mostly shipped in wet weather, 2586–2600, 2626.
The Company has inspectors to see to shipping of coal, 2597.
The Company prescribes no conditions as to ventilation; their inspector at Newcastle objects to it, 2601–2603, 2611, 2615–2617, 2626.
Reads memorandum relative to spontaneous combustion of coal on shore, and in bunkers of the Company's steamers, 2604.
Coal stacks of the Company; mostly covered; firing very rare; instances cited, 2604–2606.

Davis, Mr. A. O. (Evidence of)—*continued.*
Three or four cases of explosion in bunkers of Company's steamers, owing to "close" covers being kept on too long, 2604.
South Wales coal less liable to spontaneous combustion than Newcastle or North Wales coal, 2604.
Larger per-centage of casualties in 1874 than in any previous year, 2607–2610.
The Company insures its coal; rates have risen, 2612–2614, 2618–2623.
Has never compared Company's casualties with others, 2624, 2625.
Allusion to the "Corah," which went safely, unventilated, 2626–2629.

Derry, Mr. Samuel E. (*Analysis of his Evidence.*)
Was formerly inspector of coal shipped for the Admiralty in South Wales; is now a retired chief engineer in the Navy, 891–893.
Has known three cases of spontaneous combustion, all with Parson's Abbey Graigola coal; they occurred at Jamaica and Barbadoes; states particulars, 894.
Parson's Abbey Graigola coal; it is a smokeless coal from Llansamlet; iron pyrites is so intimately mixed with it as to make it liable to catch fire; it is from one particular vein (the Tyr Edmond) that the dangerous coal comes; it was simply inspected, before being ordered for the Admiralty; witness ceased to ship it after the casualties; 895–925, 936–940, 950–957.
Iron pyrites in coal; if localized in large masses, it is less liable to take fire than where it is intimately mixed; where much mixed, either damp or friction will cause spontaneous ignition, 905, 908, 923, 942–949, 962–965.
Coal should be free from small at the time of shipment; small coal assists spontaneous combustion, but it is not generally liable to fire, 909, 941, 942, 966–972.
Has never known a case of good South Wales coal catching fire spontaneously in the main body of the coal, 923, 928, 929.
Has never known a case of spontaneous combustion in patent fuel, 926, 927.
Has known cases of explosions of gas in vessels; this occurs when the hatches are put on before the cargo has given off its gas; ventilation is absolutely necessary, 929–935.
Coal was sent for trial before being admitted for Admiralty use, but the trial might have been fallacious, 953–957.
Coal shipped wet would be liable to spontaneous combustion, 958–961.

Devonport.
Storage of coal at, 1100.

Drops for Loading Coal.
See *Shipment of Coal.*

Durham.
Combustion of coal-stores at, 2739, 2777.

E.

Equator.
Analysis of results in coal-laden ships crossing the, 36–147.

Explosions of Coal in Ships.
No reliable statistics concerning, *Rep.* p. xxiii.
Surface ventilation requisite for guarding against, *Rep.* p. xxv.
Owing to marsh gas, *Rep.* p. xxviii.
Board of Trade inquiries respecting, *App.* p. 41; Q. 2800.
Papers from Admiralty relating to, *App.* 60.
On the Tyne, 444.
In vessels of the Navy, 581, 605, 1112.
Of South Wales coal, 929, 1942, 2492, 2829.
Not common in wooden ships, 1133.
At Cardiff, *App.* p. 59; Q. 1491.
In the Northumberland Dock, 1658.
Explosion mistaken for spontaneous combustion, 1959, 2036.
Of Londonderry gas coal, 2091, 2129.
At Birkenhead, 2453.
In bunkers of steamers, 2604.
Ventilation is only useful against, 2741.

Export of Coal.
From chief British ports, in 1873–75, *Rep.* p. vii.

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F.

Farrer, Mr. Thomas Henry. (*Analysis of his Evidence.*)
Is Permanent Secretary to the Board of Trade, 14.
This Commission was instituted because Board of Trade's inquiries (under Merchant Shipping Act) into cases of burning of coal-laden ships failed in regard to scientific and complicated cases. Lloyd's Committee and the Salvage Association also desired inquiry by a special body, 16, 17.
Puts in papers respecting the "Herbert Grahame" and "Minnie Grahame," Abstract of Wreck Register, and two Returns, 18–25.
Board of Trade takes cognizance only of British ships, 27–30.

Fawcus, Mr. G.
On prevention of explosions in coal ships, *App.* p. 32.

Ferguson, Professor.
Chemical analysis of coal by, *App.* p. 109.

Finlay, Mr. James. (*Analysis of his Evidence.*)
Is master of a ship, and has been constantly carrying coals, 472–474.
Describes case of combustion in the ship "Alfred;" the coals were from the Tyne; they became heated when within a few days' sail of Valparaiso; the ship was lost; there was no ventilation whatever, 475–486, 508–514, 539–542.
'Tween decks a great help to a ship's ventilation, 486.
Has carried coal for 20 years in ships that were ventilated; they had wooden ventilators running fore and aft through the coal in the lower hold; attributes freedom from casualties to proper ventilation, 487–507, 515–536.
Great diversity of opinion exists about ventilation; the majority are in favour of it, 537, 538.
By applying above system of ventilation, by visiting the hold every day, and keeping off the hatches, coal may be safely carried, 543–545.

Fire in Coal-laden Ships.
Water and steam for extinguishing, recommended by Commission. *Rep.* p. xxiv.
Report on, *App.* p. 32.
Use of water for extinguishing, 761.
Use of carbonic acid, 761, 763, 1424, 1469, 1817, 1823, 1843, 1901, 2743, 2772.
Use of steam, 1933, 2867.

G.

Galloway, Captain John. (*Analysis of his Evidence.*)
Has been master of merchant ships, and used to carrying coal (mostly Scotch coal) for about 20 years, 2350, 2351, 2378–2381, 2384–2392, 2409–2411.
Has known but one case of spontaneous combustion of coal on board ship, 2352–2396, 2408.
Case of heating on board the "Malabar;" loaded with Langley Mill coal, in a wet condition; fired when 36 days out; ship was ventilated; totally lost; casualty owing to coal being damp, 2352–2378, 2381, 2382, 2398–2407, 2411, 2417–2430.
Approves of ventilation of coal cargoes; would have a platform, with a current of air underneath, 2382, 2383, 2386–2389, 2411–2416.
Casualties are increased now by coal being taken direct from pits to ships, the gas not having time to escape; also by vessels being larger, and carrying greater masses of coal than formerly, 2386–2391, 2397.
Witness had carried coal for eight or ten years without ventilating his ship, and had no casualty, 2386–2389, 2395, 2396.
Instances of Scotch coal firing, 2392–2394.
Exposure of coal to the air before shipment is an element of safety, 2428.

Gases.
Occlusion of, in coal, *Rep.* p. xxvii.
Marsh gas the source of explosions, *Rep.* p. xxviii.

Gases in Coal Cargoes.
Paper on, *App.* p. 31.
Prevention of, *App.* p. 53, 60.
See *Explosions of Coal in Ships.*

Gasworks.
Combustion of coal in, *App.* p. 109–112.

Glasbrook, Mr. John. (*Analysis of his Evidence.*)
Is a colliery owner and mining engineer at Swansea; has shipped coal for upwards of 30 years, 2179, 2180, 2345.
Swansea coals; only two are not liable to spontaneous ignition, viz., the 4-feet and the 6-feet vein; some will take fire on the wharf; some may go safely a short distance; objection to seams above Hughes's, and to the Cistern, Slatog, Bodor, Rhondda coals, &c., 2181–2186, 2189–2196, 2199, 2210, 2211, 2224–2239, 2244–2249, 2251, 2259–2262, 2285–2336, 2345–2348.
Has had one case only of spontaneous combustion—the "Alpha," 2187, 2188.
Mixing coals causes spontaneous combustion, 2190, 2244–2249, 2263–2272, 2285, 2286, 2335.
Spontaneous combustion of coal arises from its impurities, as sulphur and phosphorus, shale, earthy matter, pyrites, and "mother-of-coal," 2193–2197, 2303–2310.
Casualties occur through men not working the coal clean; desirable if they could be compelled to do so, 2197, 2198, 2200–2204, 2222, 2223, 2335.
While coal was high-priced inferior qualities were shipped; this was a cause of firing, 2201–2204, 2334.
Coal cargoes should be separated, and kept in compartments; this would be better than ventilation; a hole made in the cargo might be good, 2205–2209, 2277–2282, 2337–2344, 2349.
Coal should be shipped dry, 2209.
Shipping of coal in boxes, by steam crane, is a good mode, and does not increase cost, 2212–2222, 2254–2258.
To avoid casualties, ship coal not liable to ignite; do not ventilate; divide ship into compartments; and lower coal in boxes, 2218–2223, 2250.
Has never known patent fuel to take fire, 2240–2243.
Abbey Graigola coal takes fire if mixed with Tyr Edmond, 2244–2249.
Several cases of coal cargoes igniting when carrying Rhondda coal, 2251, 2252, 2259–2262.
Steam coal travels safely, 2253, 2327, 2328.
Coal is not liable to get mixed in working, unless it is done on purpose, 2263–2272.
Witness does not insure his ships; belongs to an insurance fund, 2273–2276, 2290, 2294.
Desirable if temperature of coal cargoes were tested by a thermometer, 2282–2284.

Glover, Mr. John. (*Analysis of his Evidence.*)
Is a chemical manufacturer at Newcastle, and a member of the Chamber of Commerce of Newcastle, 1807, 1808.
Ventilation of cargoes of north country coal; it should rather be avoided than sought for; the surface of the coals should be ventilated; iron gas pipes might be inserted in the coal for ascertaining the temperature, 1810–1814, 1817, 1821–1823, 1870–1873.
Witness's experience is confined to north country coal, 1812–1814.
Spontaneous combustion of coal; chiefly owing to its containing bisulphide of iron (in form of brasses or pyrites) with moisture, and also bituminous shale; and to the presence of finely-divided coal; pyrites finely divided favours combustion, 1815–1820, 1827–1842, 1847–1868, 1884–1900, 1923–1926.
Temperature of coal cargoes should be examined every day with a thermometer, and entered in a log, 1817.
Coal may take fire at very low temperature; some coals more likely to fire than others, 1817, 1824–1826.
No one mode of loading coal is better than another as respects combustion, 1818–1820.
Spontaneous ignition of coal is only a question of time, 1818, 1824.
Application of carbonic acid gas to heated coal cargoes; apparatus described, 1817, 1823, 1843–1846, 1865–1867, 1901–1922, 1927–1932.
Cannel coal finely divided would be likely to take fire, 1862–1864.
Moisture is one of the main conditions of the firing of coal; coals shipped wet might perhaps have a current of hot air injected through them, 1869–1876, 1916, 1935, 1936.
North of England small coal is dirtier than formerly, 1879–1883.
Heaps of coal must be large (perhaps 200 to 500 tons) to ignite spontaneously, 1886–1891.
Objection to application of steam for extinguishing fire, 1933, 1934.

Goose-neck Drop.
See *Shipment of Coal.*

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Graham, Professor.
Allusion to his report on the firing of the "Amazon," 1817, 1934.

Great Western Railway.
Box system of loading coal used by, 798.

"Green" Coal.
Danger from, 2805.

Greenough, Mr. W. W.
On coal used by Boston Gaslight Company, *App.* p. 114.

H.

Hancock, Mr. Robert John. (*Analysis of his Evidence.*)
Is shipping manager to Messrs. Charles Hill and Sons, of Bristol and Cardiff, 1309.
Has shipped about 75,000 tons of coal (both steam and smelting coal) in the last ten years, 1310–1312, 1343, 1350.
Has never had a case of explosion, or of actual spontaneous combustion, 1313.
Has had one case of coals becoming heated, in the ship "Her Royal Highness;" heating resulted from the coals being placed on the bottom of the ship, and from their having got wet on shore, 1313, 1314, 1324–1330, 1344, 1345, 1354–1358.
Carries his coal on a platform 16 to 20 inches from bottom of ship; this promotes coolness and dryness; uses ventilators fore and aft, and in each hatchway; platforms are used by guano vessels in Callao trade, 1315–1319, 1337–1340, 1346.
Wet is a cause of spontaneous combustion, 1315, 1341, 1351, 1352.
Shipping coal; danger would be lessened by taking only large coal on board at first, and putting large coal in each hatchway; has generally shipped by tips, but sometimes by box-drops, 1320–1323, 1329, 1331–1336, 1353.
Understands iron pyrites to be the cause of spontaneous combustion of coal, 1327.
His captains are instructed, in a general way, to watch heating of cargoes by thermometer, and look to the ventilators, 1347–1349, 1359.
Has given particular attention lately to the subject of spontaneous combustion of coal in ships; the Chamber of Commerce of Cardiff has taken up the subject, 1359–1368.
Has found the per-centage of loss by spontaneous combustion of coal in ships to be not over one-half per cent. over the whole kingdom, 1367, 1368.
Ventilation could not be dangerous to coal, but after a fire occurred it would tend to feed it, 1369.
Pays very little extra (not more than one per cent.) for insurance now than formerly on coal cargoes, 1370–1380.

Harwood, Mr. James. (*Analysis of his Evidence.*)
Is employed at Portsmouth, 974.
Had one case of heating at a coal-store in Jamaica; the coal had got wet; it was Parson's Abbey Graigola coal; had it taken out, and, when replaced, put iron tubes into it to carry off the gas, 1004–1012.

Hatchways of Coal Ships.
Fire chiefly occurs there; should be filled with large, not small, coal, 1228, 1283, 1320–1323, 1329–1336, 1353, 2124–2128, 2498, 2556, 2561.

Hill, Mr.
Statistics by, relating to casualties to coal ships, 1365.

Hoist for Loading Coals.
See *Shipment of Coal.*

Hollingdrake, Mr. R.
His method of extinguishing fire by steam, 2867.

Hosier, Captain Henry M. (*Analysis of his Evidence.*)
Is Secretary to Lloyd's, 1.
Puts in lists of coal-laden vessels lost or damaged, and of missing coal-laden vessels; and a letter from the coal inspector of the Peninsular and Oriental Company to the Committee of Lloyd's, *App.* p. 104–108; *Q.* 4–13.

Howe, Mr. E.
On spontaneous combustion in coal-stores, *App.* p. 113.

I.

Icely, Mr. C.
On combustion of coal in Plymouth Gasworks, *App.* p. 109.

Inman, Dr.
On spontaneous combustion, *App.* p. 26.

Inspectors of Mines.
Should inquire into cases of spontaneous combustion of coal, *Rep.* p. ix., xxv.

Insurance of Coal Ships.
Statistics prepared for Underwriters' Association of Liverpool, 32.
Premiums; rise of, &c., 154, 1244–55, 1270–1274, 1294–1308, 1370–1380, 1441–1449, 1483, 1484, 2052, 2097, 2273–2276, 2290, 2294, 2612, 2618, 2724.
Shippers' insurance fund, 2273.

Iron Pyrites in Coal.
See Coal.

Ironworks' Collieries.
Coal from, liable to spontaneous combustion, 2015.

J.

Jamaica.
Spontaneous combustion of coal-store at, *App.* p. 63, 64; *Q.* 620, 917, 979, 1004.

Jettisoned.
Heated coal cargoes jettisoned, 105.

Jeula, Mr. Henry. (*Analysis of his Evidence.*)
Is an underwriting member of Lloyd's; was formerly Honorary Secretary to the Statistical Committee of Lloyd's, 2, 3.
Puts in paper of suggestions for inquiry, *App.* p. 140: *Q.* 12.

K.

Kennedy, Captain William. (*Analysis of his Evidence.*)
Has commanded ships, and had experience in carrying coal, for 18 years, 2533–2536.
Has known one case of spontaneous combustion, 2537.
Instances of voyages without casualty made by witness in coal-carrying ships not ventilated, 2538, 2539, 2554.
Case of burning of "L'Aquohama;" loaded by tip; coal much broken; ventilated; totally lost; due to small coal lying under main hatchway, 2539–2545, 2571–2574.
Doubts practical worth of ventilation through coal cargoes; his owners approve of it; surface ventilation desirable, 2546–2554, 2565, 2566.
Salt water will not make coal take fire; fresh water promotes heat in coal; effect of water on cotton, 2551, 2575–2579.
Great danger arises from small coal in the hatchways; due to shipping by tip, 2555–2562.
Instances four ships firing in the hatchways after being loaded under the tip, 2556.
Registers temperature of cargo in log-book; has always experienced heat at the hatchway, even when cargo has been carried safely, 2568–2570.

Keyham.
Combustion of coal-store at, 900.

L.

Legislation.
Statutory inquiries respecting burnt coal ships, *Rep.* p. ix.; *Q.* 16.
Suggested only in regard to inquiry by inspectors of mines and as to specification of coal entered outwards, *Rep.* p. xxv.
Desirable for inspection of coal ships, 424, 1438.
For causing temperatures of coal cargoes to be taken, 1797.
For making men work coal clean, 2222.
For enforcing ventilation of coal ships, 2713.

Lignite.
Casualties in shipment of, from Marseilles, 106.

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Limerick.
Combustion of coal-store at, 2175.

Lists of Coals.
Mr. Rundell's, *App.* p. 127, 130–138; Q. 2442, 2527.
Brown's, 100.
Admiralty's, 2164.
See *Statistics of Coal.*

Liverpool.
Statistics of coal vessels sailing from, *App.* p. 127.

Liverpool Salvage Association.
Report by, on ventilation of coal ships, *App.* p. 32.

Lloyd's.
Correspondence between, and Board of Trade and London Salvage Association, *Rep.* p. v.; *App.* p. 1; Q. 16.
Return of coal shipments by, *Rep.* p. vi.
Statistics relating to coal shipments in 1874 from, *App.* p. 101.
Lost or missing coal-laden vessels posted at, 4–12.
Letter to, from coal inspector of Peninsular and Oriental Company, 13.
Desired further inquiry into cases of burnt coal-laden ships, 16, 21.
See *Tables.*

Loading of Coal.
See *Shipment of Coal.*

Local Marine Boards.
Correspondence of Board of Trade with, arising out of the case of the "Persia," *App.* p. 25. From—
Abergavenny, *App.* p. 33.
Cork, *App.* p. 26.
Dundee, *App.* p. 29.
Glasgow, *App.* 32.
Greenock, *App.* p. 31.
Leith, *App.* p. 29.
Liverpool, *App.* p. 26.
London, *App.* p. 26.
Newcastle, *App.* p. 30.
North Shields, *App.* p. 32.
South Shields, *App.* p. 31.
Sunderland, *App.* p. 28.
West Hartlepool, *App.* p. 33.

London Salvage Association.
Correspondence of Board of Trade, &c. with, *Rep.* p. v.; *App.* p. 1; Q. 16, 21.

M.

Madras Railway.
Ignition of coal shipped for, 700.

Marine Boards.
See *Local Marine Boards.*

Marseilles.
Shipment of coal from, 106.

Marsh Gas.
The source of explosions, *Rep.* p. xxviii.

Masters of Vessels.
Information afforded by, *App.* p. 76, 85.

Mather, Mr. J.
On gases in coal cargoes, *App.* p. 31.

Mauritius Marine Board.
Report of, on loss of the "Persia," *App.* p. 25.

McConnochie, Mr. J.
On systems of coal-shipping in South Wales, *Rep.* p. x.

McCulloch, Mr. Henry Johnson. (*Analysis of his Evidence.*)
Is Consulting Coal-engineer to the Navy, and has been connected with the coal trade more than 30 years, 696–699.
States particulars of three cases of spontaneous combustion, one with coals shipped for the Admiralty, and two with coals shipped for Madras Railway; the first casualty was owing to something external to the coal, and the others to the coals having become wet, 700–724, 848–852, 857–866, 879.
Cowpen Hartley coal; it is very free from sulphur, and one of the best coals on the Tyne, 713–717, 832, 833, 848.
Casualties in the "Numea" and "Palmyra," 713–724.
Iron pyrites in coal; all coal contains it, 717, 748, 818–833, 839–842, 865, 866.

McCulloch, Mr. H. J. (Evidence of)—*continued.*
Per-centage of casualties with which witness is acquainted is very small, 726.
Casualties in the "Rattlesnake," "Racoon," and "Megæra" were cases of heating from external causes, 727–730.
Methods of shipping coal; the best is that on the Tyne, and at Blyth and Sunderland, 731–742.
Coal should not be broken in shipping; the larger the coals the greater their value, and the less danger there is from fire, 735, 741.
Methods of transporting coal from pit to place of shipment; waggons, swing-drops, &c.; the larger the waggon the worse for the coal, 743–747, 763–817, 873.
Spontaneous combustion of coal (except anthracite) is caused by moisture, 748–750, 827, 867, 870, 872.
The increased number of cases of spontaneous combustion is owing to increase in exports, and to carelessness in shipping and ventilating coal, 751–758, 855, 856, 890.
Thorough ventilation would save coal-laden ships from danger; ventilator described, 759, 760, 834–838, 874–878, 883–890.
For extinguishing fire in coal-laden ships, water is more likely to be useful than the extincteur, 761, 762.
Objection to the system of double-screening of coal, 790, 791.
North of England system of shipping coals should be introduced into South Wales, 812.
Careful inspection of coal at the ports; comparative safety is owing to this, 843–847.
Has known many cases of spontaneous combustion of coals stored on shore; more than afloat, 853, 854.
Every coal (except anthracite) is liable to spontaneous combustion, 869.
There is not sufficient water in coal internally to make it liable to spontaneous combustion, 872.
Coals lose but little of their combustive property in the course of a voyage, 880–882.

Merchant Shipping Acts.
Unsatisfactory inquiries under, respecting burnt coal-ships, 16.

Mersey.
Letter, &c. respecting sailings of coal ships from, *App.* p. 127.

Mersey Docks and Harbour Board.
Papers furnished by, *App.* p. 118.
See *Tables.*

Messent, Mr. P.
Sketches of coal-shipping on the Tyne sent by, *Rep.* p. xv.

Mines' Regulation Act.
Has caused removal of boys who cleaned coal, *Rep.* p. ix.; Q. 1710, 1737.

Mixture of Coals.
In relation to spontaneous combustion, 641, 642, 660, 661, 670, 671, 2190, 2244–2249, 2263–2272, 2285, 2286, 2335.
For Navy use, 642, 670.

Moisture in Coal.
See *Coal.*

Montreal.
Spontaneous combustion of coal at, *App.* p. 113.

Moore, Mr. Robert. (*Analysis of his Evidence.*)
Is chief engineer, 1098.
Has never seen any heating of coal; mentions a case of spontaneous combustion in the coal bunkers on board the "Gladiator," 1108, 1109.

N.

Navy.
Instructions respecting carriage of coal in vessels of the, 616, 623.
Cases of heating of coal in ships of, 581, 701.
Approval of system of ventilation adopted by, 2828, 2814.

Newcastle.
Temperature of coals of, *App.* p. 112.

New England Association of Gas Engineers.
Paper read before, *App.* p. 111.

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Newton, Mr. John Paul. (*Analysis of his Evidence.*)
Is commander of a coal-carrying ship; has made voyages as a captain for 22 years, and met with one case of spontaneous combustion, 546–551.
Describes case of combustion in the vessel "Lochee;" she was loaded in the Tay; the coals were saturated with rain and sea water; they were from Town Hill Colliery, Fifeshire; heating discovered after about three months; when in sight of Galle she blew her decks out from end to end; she had had her hatches off every day, and was well ventilated; only 24 hours before the explosion was anything wrong suspected, 552–556, 567–579.
Attributes casualty to coals having been shipped wet, 554.
Has known other cases of Town Hill coal taking fire, and destroying vessels, 558–565.

New York Gas Company.
Statement from, *App.* p. 112.

Nova Scotia.
Papers from, respecting spontaneous combustion, *Rep.* p. xxiii.
Temperature of coals of, *App.* p. 112.

O.

Oils, Hydro-carbon.
In connexion with heating of coal, 1815, 1827.

P.

Paraffin.
In coal, 1815.

Patent Fuel.
Spontaneous combustion not liable with, *App.* p. 116; *Q.* 1547, 2240.

Peninsular and Oriental Steam Company.
Paper and statistics furnished by, *App.* p. 114.
Letter from coal inspector of, to Lloyd's, 13.
Gives no instructions respecting ventilation of coal cargoes, 1669, 1946, 2601.
Particulars as to shipment of coal of, 1786, 1967.
Insure coal cargoes, 2052, 2612.
Spontaneous combustion and explosion of coal shipped for, 2580, 2604.
Inspection of coal under, 2597.
Spontaneous combustion of coal of, on shore and on sea, 2604.
See *Tables.*

Percy, Dr.
Scientific paper by, relative to spontaneous combustion and explosion, *Rep.* p. vi., xxvi.
Allusions to his work on fuel, 1815, 1820, 1834, 1925.

Perry, Mr. W. C.
On causes of spontaneous combustion in coal ships, *App.* p. 33.

Plymouth Gasworks.
Combustion of coal at, *App.* p. 109.

Poole, Mr. Henry S.
Letter from, respecting spontaneous combustion of Nova Scotian coals, &c., *App.* p. 110.

Portsmouth.
Combustion of coal-stores at, 690.
Storage of coal at, 1105.

Premiums on Coal Ships.
See *Insurance.*

Price, Mr. W. R. (*Analysis of his Evidence.*)
Is a shipowner in London, 1136, 1242, 1243.
Has had experience of two cases of spontaneous combustion of coal, in the "Calcutta" (77 days out), and the "Oliver Cromwell" (80 days out), both wooden ships; believes the coal was Howard's West Hartley; it was put on board by tips; it was much broken; it was ventilated by a horizontal shaft near the bottom; both ships were lost; report on the loss, 1137–1168, 1185, 1186, 1191–1196, 1201, 1202, 1222–1224, 1228–1231, 1256–1261, 1264.
Burning of the "Euxine," an iron ship, loaded at the same time as the above, 1169–1172, 1186–1188, 1197, 1198.

Price, Mr. W. R. (Evidence of)—*continued.*
Safe passage of the "Corah," loaded about same time as above, and not ventilated, 1173, 1174, 1199, 1200, 1262–1266.
Shipping of coal by barrows is the best way; boxes the next; there is less breakage, and more ventilation through the cargo; it takes longer, and costs more, 1175–1183, 1203–1221, 1288–1292.
Witness has carried principally from Birkenhead; method of shipping coal there is by tips and by barrows; to the character of the coal shipped there may be attributed its immunity from accident, 1178–1185, 1275–1277.
Numerous cases of burning of vessels from the Tyne; objections of witness to experimenting with Tyne coal, 1188, 1267–1269.
Burning of the "Berenice," having Tyne coal on board, 1188.
If witness had to carry coal from the Tyne he would adopt the same mode of ventilation which he has applied to vessels going from Birkenhead, 1184, 1226, 1234, 1235, 1267.
Objection of Mr. Steinson to through ventilation of coal in ships; it should be above the coal, and the hatches should be kept open when possible, 1202.
Spontaneous combustion of coal takes place in the fine slack, 1227–1233.
Has always instructed his captains to keep the hatches off for fear of explosions, 1236.
Gives instructions now to try the heat of the coals with the thermometer, and record it in the log, 1236–1241.
High rate of insurance on coal; it prevents its being carried in high-class ships; witness contemplates taking his own insurance risk, 1244–1255, 1270–1274, 1302–1305.
Has carried Cardiff coal, and always ventilated it, 1278–1282.
As an insurance broker, witness has insured ships in which cases of combustion have occurred, 1294–1301, 1306–1308.
Danger of heating of small coal in the main hatchway, 1151, 1166, 1228–1233, 1283–1287.

Prim, Mr. William Jacob. (*Analysis of his Evidence.*)
Is Resident Engineer to the Houses of Parliament, and was formerly Chief Assistant to the Manchester Steam Users' Association, 2862–2866.
Describes Mr. Robert Hollingdrake's patent for extinguishing fire by means of steam; it might be successful on board ship; the vessel might be fitted with perforated pipes, &c., 2867–2898.

Pyrites in Coal.
See *Coal.*

Q.

Questions by the Commission.
Proposed to be put to captains of coal vessels in which casualties have occurred, 1826.

R.

Resiniferous Shale.
In Tasmania, *Rep.* p. xxvi.

Richters, M.
Experiments by, on weathering of coal, *Rep.* p. xxvii.

Roberts, Edmund Squire. (*Analysis of his Evidence.*)
Is inspector of coal shipments at Cardiff for the Peninsular and Oriental Company; has inspected about 1,000,000 tons of coal, and 700 ships, 1937–1941.
Has had one case of explosion, none of spontaneous combustion, 1942, 1943, 1963–1966, 2057–2060.
Best steam coal is not subject to spontaneous combustion, 1944, 1945.
Objection to through ventilation of coal cargoes; coal stores on land should be ventilated; ventilation should be on the top, 1952–1959, 1989–1999.
Does not believe in spontaneous combustion, 1959–1963, 2036, 2060.
Shipment of coal; is particular with regard to avoiding breakage; system described, 1967–1979, 2042–2056, 2061–2071.
Storage of coal at Alexandria; each stack was ventilated by a tunnel through the coal, to prevent spontaneous combustion, 1980–1998.
Only the best coals should be sent on long voyages, 2,000.

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Roberts, E. S. (Evidence of)—*continued.*
South Wales coals; some are dangerous from containing iron pyrites, as No. 2 Rhondda, most Monmouthshire coal, &c., 2004–2039.
Ironworks coal is liable to spontaneous combustion, 2015–2035, 2072.
Has never heard of patent fuel catching fire, 2040, 2041.

Royal Mail Steam Packet Company.
Information furnished by, *App.* p. 114.
See *Tables.*

Rundell, Mr. R. Cooper.
On sailings, &c. of coal ships from the Mersey, *App.* p. 127.

——— (*Analysis of his Evidence.*)
Is Assistant to Secretary of Underwriters' Association of Liverpool, 31.
Has prepared statistics with a view to discover probable cause of spontaneous combustion of coal in ships, and afford means of estimating the increased risk, 32–36, 100–105.
Greater number of fires occur about the 60th day after leaving port; fires have occurred in most of the varieties of coal exported; fires occur in the cargoes whether coal be ventilated or not, and whether loaded in summer or winter, by tip or basket; statistics in illustration of foregoing, 37–57.
Certain amount of moisture present in all coal, 37.
Classification of coal ports, and comparison of sailings and casualties, 46–57.
Cannel is a safe class of coal, 51, 52.
Orrel coal bears a high character, 52.
Crow Orchard coal thought to be liable to spontaneous combustion, 53.
Bituminous coals are avoided by some underwriters; accidents with them, 54, 55.
Casualties in connexion with coal shipped from Lancashire and South Wales ports, 55, 73, 76.
Tonnage of ships (sailing and steamers) in which casualties have occurred; time between sailing of ship and indication of heating, 58–64.
Summer sailings are the most dangerous; most casualties have occurred in September and October, 65–69, 94–99.
Effect of temperature; when and where heating first discovered, 69, 70.
Selected sailings, and number of heatings to number of voyages, 71–73.
Shipment of coal by hand and tip; shipment by tip breaks the coal, and increases the danger; shipment by barrow preferable, 74–76, 107, 108, 114–117, 157–168.
Coal with which casualties have occurred, and ports from whence shipped, 77–86.
Casualties do not show clearly the comparative liability of coal to spontaneous combustion, 87.
Accidents in iron and in wooden vessels, 88–93.
Ventilation of vessels in which casualties have occurred; difficult to say whether a vessel is sufficiently ventilated; certain system recommended by underwriters' surveyors; shutting up coal would conduce to its combustion, 90, 91, 118–120, 141.
Casualties in shipment of lignite from Marseilles, 106.
Casualties, other than burning, occurring to coal-laden ships, are rare, 109–111.
Nothing to show whether double-screened coal would fire sooner than single-screened, 112, 113.
Cases of coal becoming pasty from exposure, while waiting for ships, 120, 121.
Dampness of coal, and spontaneous combustion, 122–125.
Great increase of casualties from combustion of coal afloat in 1874; casualties not on the increase generally; connexion between casualties and increased demand for coal, 126–136.
Casualties proceed from condition in which coal is shipped, 135.
Connexion of casualties and the labour question; increased cost of labour; pitmen not fined now for sending up bad coal, 137–139.
Casualties are to be attributed to what occurs before the coal is shipped, 140, 145.
Coal is carried generally in a better class of vessel than formerly, 142–144.
Comparison of longer and shorter voyages; longer voyages afford a good specimen, 146–153.
Premiums have risen for short, as well as for long voyages, 154, 155.

Rundell, Mr. R. C. (Evidence of)—*continued.*
Coal agents who have a name to keep up are particular as to their shipments, 169.
Allusion to Coal List of, 2442, 2527.
See *Tables.*

S.

Salvage Association.
See *Liverpool Salvage Association; London Salvage Association.*

Sandeman, Captain Alfred P.
On coal cargoes, *App.* p. 139.

——— (*Analysis of his Evidence.*)
Was connected with East India Navy; afterwards Surveyor to London Salvage Association; subsequently Surveyor in Marine Department of Board of Trade, 2630–2637.
Has specially attended to question of ventilation of coal ships; approves of thorough or no ventilation; describes various systems; would ventilate to prevent cargo from getting heated; approves of ventilation being enforced by law; increased freight might have to be charged, 2634, 2641–2654, 2669–2730.
Board of Trade take no action in respect of ventilation, 2636.
Many shipowners object to ventilation, but some are in favour of it, 2647, 2729.
Impossibility of shipping coal thoroughly dry, 2652.
Large amount of pyrites in some coals; this induces combustion, 2654–2658, 2664–2670, 2689, 2690.
Instance of heating in a cargo hermetically sealed, 2658–2663.
Liverpool coal; impossible to ship it thoroughly dry; some sorts heavily charged with pyrites; less pyrites in coal shipped in the Liverpool than on the Birkenhead side, 2652–2657, 2683–2690.

San Francisco.
Casualties in coal-ships bound to, *Rep.* p. vii.

Schist in Coal.
Danger from, 1815.

Scott, Captain Henry F.
On a method of preventing spontaneous combustion of coal cargoes, *App.* p. 78.

Scott, Mr. Edward Benjamin.
Is a partner in the firm of Messrs. Gillespy and Scott; has shipped largely from all steam-coal shipping ports, principally from South Wales, 2074–2080, 2091–2095, 2147–2154.
Spontaneous combustion; danger of smelting coals; instances of steam-coal firing, 2081–2095, 2133–2135, 2138–2140.
Case of heating of coal on board the "Mary Shepherd;" carried Swansea (Resolven) coal; fired after four or five months; coal understood to have been shipped wet; it was ventilated, 2084–2087, 2168, 2170.
Liability to fire of coal shipped wet, 2086, 2177.
Case of the "Robert Watson," loaded with Coed Talon coal, containing much pyrites, 2088–2091, 2137, 2156.
Cases of the "Marlborough," "George Bradford," and "Middlesex," missing; and the "Cassange," burnt; the latter loaded with Parson's Abbey Graigola coal, 2092.
Cases of the "Princess Alexandra," carrying Londonderry gas coal, explosion; and of the "Pocahontas," carrying Hastings Hartley, burnt, 2092–2095, 2107, 2110, 2129–2132, 2154, 2157, 2158.
Insurance of ships; increase of premiums, 2096, 2097, 2116–2120.
Ventilation of coal cargoes; objection to through ventilation; where combustion is set up it would destroy the ship, 2099–2104, 2112–2115, 2121–2123, 2144–2146, 2153, 2160.
High cost of labour may induce careless picking of coal for pyrites, and so increase casualties, 2105, 2106, 2141, 2142, 2152.
Small coal is especially liable to ignition, irrespective of the presence of pyrites, 2107.
Opinion adverse to North Wales coal and South Wales smelting coal, 2108.
Has formed no conclusion as to liability to spontaneous combustion of special classes of north country coal, 2108–2111.
Danger of small coal in the hatchway, 2124–2128.
Best class of steam coal, well cleaned, is not liable to spontaneous ignition, 2143.

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Scott, Mr. E. B. (Evidence of)—*continued.*
Shipment of coal; no special approval of any one system, 2161–2167.
Coals on Admiralty list, 2169–2174.
Spontaneous combustion in coal-stores, 2175, 2178.

Screening of Coal.
Disapproval of double screening, 791.

Scurr, Captain John. (*Analysis of his Evidence.*)
Is commander of the "Brenhilda;" describes the heating of coals when between the tropics and the equator; the coals were turned over and cooled; ship had good ventilators, always open; at Calcutta the coal ignited; water was pumped on it; cause of casualty most probably in the coal itself; it was called "Watson's coal;" it was tipped, but little broken, and was dry; the ship might have been as well without ventilators; heating of the coal was probably owing to its being brought too rapidly from the bottom of the colliery into the ship, 170–349.
The "County of Perth" was loading at the same time as the "Brenhilda;" she was loaded by barrow; she took fire near Calcutta, 240–245.
The "Blair Athol," loaded just after, took fire at Bombay, 241, 246–248.

Separation of Coal.
Better than ventilation, 2205.

Sheerness Yard.
Trial of Hirwain coal, &c. at, *App.* p. 62.

Shipment of Coal.
To European, as compared with more distant ports, *Rep.* p. vii.
Shipment of small coal, *Rep.* p. ix.
Systems of loading in relation to breakage, *Rep.* p. ix.
In South Wales, *Rep.* p. x.; Q. 50, 1388, 2080, 2182.
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Anti-breakage box used in, *Rep.* p. xii.
Box system for, *Rep.* p. xii.; Q. 1331, 2212.
Crane used for, *Rep.* p. xii.
Hydraulic hoist for, *Rep.* p. xiv.
By barrow, *Rep.* p. xiv.; Q. 1180, 1203, 2539.
By spout and drop, *Rep.* p. xv.
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Danger of shipping certain coals, *Rep.* p. xxiv.
Shipments in 1874, *App.* p. 101.
Classification of ports for, 46.
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On the Tyne, at Blyth, Sunderland, &c., *Rep.* p. xv.; Q. 733–817, 1138, 1580, 1647.
Waggons for, 733, 763, 873.
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In casks or barrels, 1423.
Carelessness of officers in regard to, 2484.
At Newport, 1312, 1504.

Shipowners.
Information afforded by, *App.* pp. 66, 85.

Ships carrying Coal.
Report on fires in, *App.* p. 32.
Admiralty papers respecting fires in Government ships and stores, *App.* p. 60.
Statistics of sailings of coal ships, *App.* p. 119–138, 146, 1584–1591.
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Board of Trade takes cognisance only of British ships, 27–30.
Statistics respecting casualties from combustion in, 32.
Class of ships in which casualties have occurred, 58, 88.
Might be built with two or three decks, to separate the coal, 2349.
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"Admiral Lyons," *App.* pp. 77, 86.
"Agincourt," 1113.
"Alexander," 564.
"Alexandre," *App.* pp. 70, 94.
"Alfred," *App.* pp. 77, 58.

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"America," 2554.
"Anna," *App.* pp. 76, 93.
"Annie Laurie," *App.* pp. 67, 87.
"Arracan," *App.* pp. 78, 92.
"Atalanta," *App.* p. 59.
"Aurelie," *App.* p. 33.
"Baringa," 1297.
"Battalion," *App.* p. 99.
"Beacon Light," *App.* p. 9.
"Berenice," *App.* p. 10; Q. 1188, 1596.
"Berwick," *App.* p. 49.
"Beucleuch," *App.* p. 40.
"Bivouac," *App.* pp. 69, 90.
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"Brenhilda," *App.* p. 94; Q. 170.
"Broomhaugh," *App.* pp. 71, 99.
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"Calcutta, *App.* pp. 69, 94; Q. 1143, 1160, 1191, 1202, 1222, 1228, 1629, 1666, 2587, 2599, 2626, 2717.
"Cambria," 431.
"Cassange," 2092, 2150.
"Cattofield," *App.* p. 4.
"Centaur," *App.* p. 131.
"Cereal," *App.* pp. 68, 90.
"Channel Light," *App.* pp. 69, 91.
"City of Richmond," *App.* pp. 71, 98.
"Clevedon, *App.* p. 36.
"Clothilde," 2251.
"Columbia," *App.* pp. 66, 78, 85.
"Commodore Perry," *App.* p. 8.
"Corah," 1173, 1184, 1199, 1262, 1629, 2628, 2717.
"County of Nairn," *App.* pp. 12, 69, 90.
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"Crocodile," 1028.
"Crystal," *App.* pp. 70, 97.
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"Euphrates," *App.* p. 60; Q. 583, 631.
"Euxine," *App.* p. 71, 93, 131; Q. 1169, 1186, 1197, 1202, 1622, 1629, 1718, 2587, 2599, 2626, 2717.
"Fanny," *App.* p. 40.
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"Glaramara," *App.* pp. 68, 89.
"Glasgow," *App.* pp. 63, 596.
"Glenlyon," *App.* pp. 77, 86.
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"Glory of the Seas," *App.* p. 131; Q. 60.
"Hannah Law," *App.* pp. 77, 86.
"Henry Bath," *App.* pp. 69, 90.
"Herbert Grahame," *App.* p. 20; Q. 18, 23, 1386, 1404, 1419, 1450, 1480, 2802, 2821, 2830, 2838.
"Her Royal Highness," *App.* pp. 68, 87; Q. 1313.
"Holyrood," *App.* p. 99.
"India," 2538.
"Indian Empire," *App.* pp. 69, 92; Q. 1654.
"Industry," *App.* p. 95.
"Isabella Kerr," *App.* pp. 69, 92.
"Janet Cowan," *App.* p. 88.
"J. H. Lorentzen," *App.* p. 100.
"Joanna," *App.* pp. 67, 87.
"John," *App.* pp. 78, 93; Q. 395.
"Khersonese," *App.* pp. 69, 97.
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"La Escocesa," *App.* pp. 70, 97.
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"Levant," *App.* p. 98.
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"Manfred," 431.
"Maria Lee," 2802.
"Marlborough," 2092.
"Mary Amelia," 2453.
"Mary Shepherd," *App.* p. 86; Q. 2085, 2150.
"May Queen," *App.* pp. 67, 87.
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"Merom," 61.
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"Middlesex," 2092.
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"Oneiza," 1611, 1663.
"Ontario," *App.* p. 96; Q. 1643, 2592.
"Palmyra," *App.* 67, 87; Q. 849, 2655.
"Persia," *App.* pp. 5, 25, 68, 69, 88, 91.
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"Prince Alfred," *App.* pp. 15, 69, 91.
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"Rattlesnake," 597, 631.
"Respigadera," 61.
"River Boyne," *App.* p. 39.
"Robert Gilroy," 559.
"Robert Watson," 2088, 2137, 2150.
"Royal Family," *App.* pp. 68, 77, 87.
"Saint Mungo," *App.* pp. 16, 92.
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"William Batters," *App.* p. 100.
"Zeno," *App.* p. 41; Q. 2800, 2828, 2851.

Specification for Coal Cargoes.
Legislation recommended with regard to, *Rep.* p. viii., xxv.
Form of, *App.* p. 109.

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Selected correspondence relating to, *App.* p. 109.
Combustion of charcoal, *App.* p. 112.
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Lloyd's lists respecting, 4–12.
Statistics relating to, prepared for Underwriters' Association of Liverpool, 32–169; for Peninsular and Oriental Company, 2580.
Occurs with all kinds of coal, however shipped or ventilated, 37, 869.
Takes place when about 60 days on voyage, 37.
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Arises from condition in which coal is shipped, 135, 145, 748.
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Stacking of Coal.
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Statutory Inquiries of Board of Trade.
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Steam.
For extinguishing fire in ships; recommended, *Rep.* p. xxiv.; Q. 1933, 2867.

Steathmen.
Information afforded to Commission by, *App.* p. 82.

Steinson, Captain George.
Report by, quoted, 1201.

———— (*Analysis of his Evidence.*)
Is Coal Inspector at Newcastle for the Peninsular and Oriental Company, also for the Admiralty, the India Council, the Crown Colonies, and formerly for the Egyptian Government, 1580–1583.
Statistics of coal-laden ships, 1584–1591.
Casualties to ships by burning; one case between 1861 and 1872, out of about 1,300 ships, and, since 1872, seven cases, and three possible cases, out of 215; probably not all owing to spontaneous combustion, 1592–1667, 1713–1729.
Case of the "Eliza Rulke;" coal put on board wet, 1592–1596.
Case of the "Berenice;" loaded with Davison's West Hartley, and ventilated; no cause assigned for her taking fire, 1596–1610.
Cases of the "Oneiza," "Shalimar," "Broughty Castle," and "Sidra," missing, 1611, 1637–1642, 1650–1653.
Shipping coal; use of lowering apparatus, to which the men object; use of platform to ease the fall, 1601, 1620, 1647, 1681–1689, 1755, 1761, 1768–1789.
Case of the "Moorsfoot;" loaded with Howard's West Hartley; burnt, 1615–1621.
Cases of the "Euxine," "Oliver Cromwell," "Calcutta," and "Cora;" all loaded about same time with Howard's West Hartley; the first three, which were ventilated, were lost; the last, not ventilated, was not lost, 1622–1636, 1718–1721.
Ventilation of coal cargoes; required by charter-parties; objections to through ventilation of north country coal, which is dangerous if pyrites be present; the upper surface of the coal should be ventilated, 1632–1636, 1673–1678, 1690–1705, 1712, 1730–1735.
Case of the "Ontario;" took fire, but was not altogether burnt, 1643, 1644.
Case of the "Pocohontas;" loaded with Hastings' Hartley, by the tip; ventilated; burnt, 1645–1649.
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Cases of accidental firing of coal ships, 1658–1660.
Rise of price in coal has not induced owners so send out coal less carefully screened, 1706–1711.

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